

```
Repair Manual
New Beetle 1999 ➤ , Golf 1984 ➤
Golf Ralley 1984 ➤ , Golf Cabrio 1984 ➤ ,
Jetta 1984 ➤ , Golf 1992 ➤ ,
Vento 1992 ➤ , Golf 1998 ➤
Golf Variant 1992 ➤ , Bora 1999 ➤ ,
Golf Variant 1998 ➤
Bora Variant 1999 ➤
Golf Cabrio 1998 ➤ , Touran 2003 ➤ ,
Passat 1988 ➤ , Passat 1994. ∨ ➤ wagen AG n/r
Passat 1997 ➤ , Passat Variant 1988
Passat Variant 1994 > .
Passat Variant 1997 ➤ , Phaeton 2003
Corrado 1989 ➤, Lupo 3L 1999 ➤,
Polo 1995 ➤ Polo Classic 1996 ➤
Polo Variant $998 ➤ , Lupo 1999 ➤ ,
Touareg 2003 ➤ , Sharan 1996 ➤
Polo Steilheck 1982 ➤ .
Polo Stufenheck 1982 ➤ .
Polo Coupe ¶982 ➤
New Beetle RSI 2001 ➤ , Polo 2002 ➤
Caddy Kasten/Kombi 1996 ➤ .
Caddy 1997 🛰 , Caddy Pickup 1997 ➤
LT 1997 \rightarrow , Transporter 1991 \rightarrow ,
Transporter 1996 ➤ , Transporter 2003 ➤
Multivan 2003 ➤ , Transporter 2004 ➤
New Beetle Cabrio 2003 ➤ . Golf 2004
Caddy 2004 ➤ , Polo 1982 ➤
California 2004 ➤ , Caravelle 2004 ➤
Golf GTI 2005 ➤ , Passat 2006 ➤ ,
Golf Plus 2005 >,
```



```
Passat Variant 2006 ➤,
Passat Wagon 2006 ➤ , LT 2006 ➤ ,
Eos 2006 ➤ , Crafter 2006 ➤ ,
Tiguan 2008 ➤ , Magotan 2007 ➤
Passat CC 2009 ➤ , Scirocco 2009 ➤ ,
Golf Variant 2007 ➤ , Golf 2009 ➤ ,
Jetta 2005 ➤ . Jetta 1999 ➤ .
Golf Plus 2009 ➤ , Polo 2010 ➤ ,
Magotan Variant 2009 ➤
Golf GTD 2009 ➤ . Rabbit 2009 ➤
Transporter 2010 ➤ Caravelle 2010 ➤ ,
Zugkopf 2010 ➤ Multivan 2010 ➤
California 2010 ➤ , Golf Variant 2010
Jetta 2011 ►, CC 2010 ►,
Amarok 2011 ➤ , Golf Wagon 2010 ➤
Jetta SportWagen 2010 ➤
Touareg 2010 \rightarrow, Polo G 2010 \rightarrow,
Caddy 2010 ➤ , Vento 2011 ➤
Sharan 2011 ➤ , Polo Lim RUS 2011
Passat 2011 ➤ , Passat Variant 2011
Caddy 2011 ➤ , Golf Cabriolet 2012 ➤
Santana 1991 ➤ , Gol 1995 ➤ ,
Gol 1999 → , Gol 2006 ➤ , Gol 2009 ➤
Parati 1999 ➤ , Parati 2006 ➤ ,
Saveiro 2000 ➤ , Polo Sedan 2003 ➤
Polo Sedan 2007 ➤ , Voyage 2009 ➤
Fox 2010 ➤ , Kombi 1997 ➤ 💿
Golf 1999 ➤ , Golf 2007 ➤ , Polo 2003 ➤ ,
Polo 2007 ➤ , Beetle 2012 ➤ pyllob
Passat (NMS - US) 2012 ➤ , Fox 2004 ➤ ,
Jetta GLI 2012 ➤ , up! 2012 ➤ ,
Polo 2012 \rightarrow , SpaceFox 2006 \rightarrow ,
```



```
SpaceFox 2011 ➤ ,
                              The Beetle Cabriolet 2012 \succ .
Copyling of purposes, in part or in whole, is not being the commercial purposes, in part or in whole, is not being the copyling to the copyling of the copylin
                             Golf 2013 ➤ , Gol 2013 ➤ ,
                             Voyage 2013 ➤ , XL1 2013 ➤ ,
                             Novo Gol 2013 ➤ , Novo Voyage 2013 ➤ ,
                             Fusca 2013 ➤ , e-up! 2014 ≽
                             Polo Vivo 2010 ➤ , Nova Saveiro 2014 ➤ ,
                             e-Golf 2014 ➤ , Fox 2014 ➤ §
                              Golf Variant 2014 ➤ ,
                             Polo KH MY 2014 ➤ , Golf 2015 ➤
                             up! 2014 ➤ , Jetta 2013 ➤ , Polo 2014 ➤ ,
                             Scirocco 2015 ➤ , Golf Sportsvan 2015 ➤ ,
                              Transporter 2016 ➤ , Multivan 2016 ➤ ,
                             California 2016 ➤ , Caravelle 2016 ➤ ,
                             Caddy 2016 ➤ , Polo Classic 2007 ➤ ,
                             Jetta 2015 🐙, Polo KH IN 2015 ➤
                             Passat 2015 ➤ Passat Variant 2015 ➤ ,
                             Novo CrossFox 2015 ➤ , Touareg 2015 ➤ ,
                             Novo Space Cross 2015 ➤ .
                             Golf SportWagen 2015 ➤ .
                             Golf Sportwagon 2015 ➤
                             Golf Variant 2015 ➤ , Golf GTE 2013 ➤ ,
                             Passat GTE 2015 ➤ , Touran 2016 ➤ ,
                             Passat (NMS - US) 2016 ➤ ,
                             Polo Lim MY 2016 ➤
                             Polo Lim RUS 2016 ➤ , Sharan 2016 ➤ ,
                             Tiguan 2016 ➤ , Golf 2016 ➤ ,
                             Voyage 2017 ➤ , Gol 2017 ➤ ,
                             The Beetle Cabriolet 2017 \succ .
                             Crafter 2017 ➤ . TGE 2017 ➤
                             The Beetle 2017 ➤ , Ameo 2017 ➤
                             e-up! 2017 \rightarrow , up! 2017 \rightarrow , Golf 2017 \rightarrow ,
```



```
Golf Variant 2017 \rightarrow . CC 2018 \rightarrow .
Atlas 2017 ➤ . e-Golf 2017 ➤
Polo 2018 ➤ , Tiguan RUS 2017 ➤
Tiguan MEX 2017 ➤ , Arteon 2018 ➤ ,
Polo Sedan SA 2003 ➤, Polo SA 2004 ➤,
up! BR 2018 ➤ , Golf MEX 2018 ➤ ,
Golf Variant MEX 2018 ➤ , Jetta 2018 ➤ ,
Golf BR 2018 ➤ , Polo Vivo 2018 ➤ .
Touareg 2018 ➤ , Virtus BR 2018 ➤ ,
e-Crafter 2018 ➤
Golf Sportsvan 2018 ➤ , e-TGE 2019 ➤ ,
e-Crafter 2019 ➤ , Gol 2019 ➤ ,
Voyage 2019 \succ, T-Cross 2019 \succ,
Passat (NMS - US) 2019 ➤
T-Cross BR 2020 ➤ , Passat 2019 ➤ ,
Passat Variant 2019 ➤ , Pluto 2019 ➤ ,
ABT eTransporter 2020 ➤ .
ABT eCaddy 2020 ➤ .
Crafter Grand California 2020 ➤,
e-up! 2020 ➤ , Transporter 2020 ➤ ,
up! 2020 ➤ , Atlas 2020 ➤
Nivus 2020 ➤ , California 2020 ➤ §
Polo Lim RUS 2020 ➤ , Caddy 2021 ➤ ,
Arteon 2021 ➤ .
Arteon Shooting Brake 2021 ➤
Tiguan 2021 ➤ , Taos Mex 2021 ➤ .
Taos Arg 2021 ➤ Tiguan RUS 2021 ➤ .
Tarek Russia 2022 ➤ , Cityvan 2022 ➤ ,
Polo 2022 → , Tiguan MEX 2022 > ,
Taigo 2022 ➤ , Jetta 2022 ➤
Taigun 2022 ➤ , e-TGE 2022 ➤ ,
TGĔ 2022 ➤ , Virtus 2022 ➤ ,
```



Virtus BR 2023 \succ , Touareg 2024 \succ , Track 2023 \succ , Atlas (PA) 2024 \succ , Cross Sport PA 2024 ➤ ,

Amarok Arg 2025 ➤ , Caravelle 2025 ➤ ,

Jetta 2025 ➤ , Taos Mex 2025 ➤

Body - General Information

Edition 10.2024





List of Workshop Manual Repair Groups

Repair Group

52 - Body, General Information



Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

All rights reserved.

No reproduction without prior agreement from publisher.



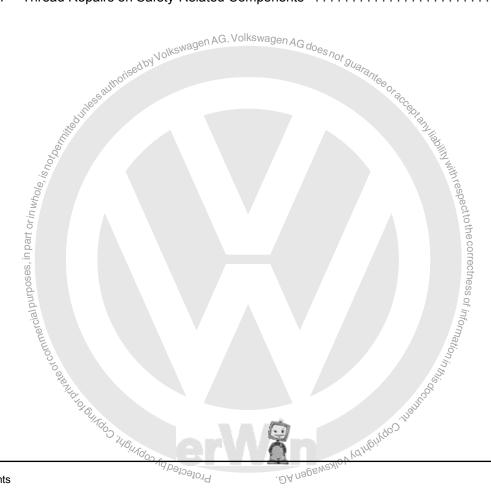
Contents

52 -	Body,	General Information	1
	1	Safety Precautions	1
	1.1	Fuel Tank or Fuel-Carrying Lines	1
	1.2	A/C System / Refrigerant	1
	1.3	Electronic Control Modules	2
	1.4	Battery, Voltage Supply	2
	1.5	High-Voltage Components / Electric Vehicles	3
	1.6	Natural Gas Vehicles (Not for North America Market)	3
	1.7	Aluminum and Steel Dust, Separating	3
	1.8	Fine Dust	3
	2	Body Repair General Information	5
	2.1	Original Joint	5
	2.2	Galvanized Body Parts	5
	2.3	Remaining Material, Removing	5
	2.4	New Parts	5
	2.5	Molded Foam Parts	6
	3	Explanation of Symbols	7
	3 .1	Symbols for Removing Components	7
	3.1	Symbols for Welding and Soldering	7
	3.3	Symbols for Rivets	8
	3.4	Symbols for Preparation	ç
	3.5	Symbols for Corrosion Protection	10
	4	Construction Characteristics of Vehicle Body	12
	4.1	Multi-Material Mix	12
	4.2	Removal Method on Multi Material Body Repair Station	12
	4.3	Types of Body Constructions	13
	5	Removal Method on Multi Material Body Repair Station Types of Body Construction and does not be a second and does not be a second and Cast Joints, Checking Load Paths	14
	5.1	General Information	14
	5.2	Weld Seams and Cast Joints, Checking	14
	0.0	Load Lating	14
	5.4	Measuring / Damage Diagnosis	17
	5.5	Overview of Materials Used	18
	5.6	Passive Safety Systems	23
	6	Thermal Joining Techniques	27
	6.1	Resistance Spot Welding	27
	6.2	Gas-Shielded Plug Welding	28
	6.3	Gas-Shielded Arc Continuous and Stitch Weld Seams	29
	6.4	MIG Soldering	29
	6.5	Aluminum Welding	30
	6.6	Laser Welds	30
	6.7	Laser Soldering	31
	6.8	Repfacement Joining Procedures in Repair (Steel)	31
	6.9	Replacement Joining Procedures in Repair (Aluminum)	32
	7	Cold Joining Procedures	33
	7.1	Bonding	33
	7.2	Rivets	35
	7.3	Overview of Rivet Heads	39
	7.4	Rivets and Tools Overview	40
	7.5	Flow-Drill Bolts 1400	45
	7.6	Clinching	47
	8	Flow-Drill Bolts	48
	8.1	Drilling	48



New Beetle 1999 \succ , Golf 1984 \succ , Golf Ralley 1984 \succ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

8.2 8.3 8.4 8.5	Sawing	48 48 49 49
8.6	Removing Rivets Accessible on One Side	50
9 9.1	Surface Repairs	51 51
9.2	Dent Removal Procedures, Aluminum Panel	52
9.3	Metal and Aluminum Body Filler, Handling	53
9.4	Unleaded Tin, Handling	53
9.5	"Accurately Contoured Surface" Definition, Transfer to Paint Shop	54
10 10.1	Straightening Procedures on Vehicle Structure	55 55
10.2	Separating Cuts	55
10.3	Body Sub-Parts and Partial Sections	55
11	Corrosion Protection	56
11.1	Corrosion Protection on Attachments and Welded Parts	56
11.2	Sealing Cavities	56
12	Plastic Repair	58
12.1	Dents, Servicing	58
12.2	Scratches, Servicing	60
12.3	Cracks, Servicing, Up to 100 mm Long	61
12.4	Holes, Servicing, Up to 30 mm Diameter	62
12.5	Plastic Repair (GFK)	63
13	Glass Repair	66
13.1	Windshield Repair	66
14	Thread Repairs	69
14.1	Thread Repairs on Safety-Related Components	69



ngen AG. Volkswagen AG d



Body, General Information

Safety Precautions

(Edition 10.2024)

VKAH000013.21 -- 11/4/2024

- ⇒ "1.1 Fuel Tank or Fuel-Carrying Lines", page 1
- ⇒ "1.2 A/C System / Refrigerant", page 1
- ⇒ "1.3 Electronic Control Modules", page 2
- ⇒ "1.4 Battery, Voltage Supply", page 2
- ⇒ "1.5 High-Voltage Components / Electric Vehicles", page 3
- ⇒ "1.6 Natural Gas Vehicles (Not for North America Market)",
- ⇒ "1.7 Aluminum and Steel Dust, Separating", page 3
- ⇒ "1.8 Fine Dust", page 3

CAUTION

If welding, soldering or cutting with spark-producing tools in foamed areas hazardous gases are produced.

- Never weld, solder or separate within 15 mm of molded foam parts.
- Perform the procedures with extraction.

Welding and sanding must be carried out with ventilation.

Never weld and sand in any area at the same time.

Clean the work area regularly depending on the amount of dust.

Do not blow out the accumulated with compressed air.

Empty the extraction system after usage.

Follow all country-specific regulations regarding accident prevention and safety on the workplace.

1.1 Fuel Tank or Fuel-Carrying Lines



WARNING

Risk of the fuel tank or fuel-carrying components exploding due to any sanding, welding or separating work.

Severe injuries and burns are possible.

ing

Not guarantee or acceptant library and the correctness of information in the correctness of information When sanding, welding or separating near the fuel system remove the fuel tank or fuel-carrying components.

1.2 A/C System / Refrigerant

⇒ "1.2.1 Corrective Measure:", page 2

Never weld or hard/soft solder components of a filled A/C system. This also applies to welding and soldering on the vehicle, if there is a risk that it may heat up components in the A/C system. When performing paint repairs, objects in the drying oven or its pre-warming area may only reach 80 °C (176 °F). This is because warming causes high pressure to develop in the pressure relief valve on the A/C compressor.



Note

Coolant systems must also be extracted if electrical welding will take place around coolant lines. When welding electrically, invisible ultraviolet rays are released that penetrate the coolant hoses and damage the coolant.

1.2.1 Corrective Measure:

Evacuate the refrigerant circuit. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87; Heating and A/C System

1.3 **Electronic Control Modules**

Connect electric welder ground (GND) connector directly to the piece to be welded. When doing so, be careful that there are no electrically insulated parts located between the ground connection and the welding location.

Do not touch electronic control modules and electrical wires with the ground connection or welding electrode.

Replacing electronic control modules after a collision is only required if at least one of the following conditions is met:

- The housing is distinguishably deformed or damaged.
- The contact surface or bracket is deformed; the device shows no damage on the outside.
- The connector is damaged or corroded by moisture.
- The function test or OBD of the device shows the fault: "Control module faulty".

.ult:

.utrol modules,
,then they
.uable information

.ultrollsentory Volkswagen AG. Volkswagen AG does not out a transfer of the state If electronic components, for example the ABS control modules, are removed for repair work and then reinstalled, then they must be checked for function according to available information after assembly, using OBD, for example.

Battery, Voltage Supply



Note

Make sure the radio code is available before disconnecting the battery. Before giving the vehicle to the customer, enter the correct code number to make the radio ready to play.

Before welding, you must remove both battery terminal clamps and cover both battery terminals

You must remove the vehicle battery before performing work near the battery that could produce sparks.

Follow the vehicle-specific instructions in the repair manual before connecting the battery.

Refer to ⇒ Electrical Equipment Rep. Gr. 27; Battery; Battery, Disconnecting and Connecting. - WILL TO BUILD THE INDO SANDER





1.5 High-Voltage Components / Electric Vehicles

DANGER

Life threatening danger by electrocution or electric arcs when high-voltage components and high-voltage cables are damaged.

- Perform a visual inspection of the high-voltage components and the high-voltage cables.
- Never use cutting, shaping, or sharp-edged tools near high-voltage components and high-voltage cables.

1.6

There is a risk of explosions and fatal injuries due to damaged natural gas tanks.

1.7

Article and high-v.

ge components and e.

by properly trained and .

Autral Gas Vehicles (Not for North
Autral Gas Sub (North
Autral Ga All emissions of the new lightweight materials fall under the hazardous materials ordinance (national regulations). These require, independently from all repair quality related guidelines by the vehicle manufacturer, a risk analysis by the company performing the repair.

The employers may permit work with hazardous substances only after, a risk assessment has been performed and the required safeguard measures have taken place.

This means in the specific case, each repairing workshop is legally obligated to create such risk assessment, before the procedures are started or continued.

1.8

Fine aluminum dust





New Beetle 1999 ➤ , Golf 1984 ➤ , Golf Ralley 1984 ➤ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

Physical:

Aluminum dust is combustible and depending on the particle size and concentration, explosive

Chemical:

Fine steel dust

Physical:

Chemical:

- .r produce a comt.

 .ric oxide (rust) react unde
 .rmic redox reduction)

 + ferric oxide + strong ignition sou.
 .tio of 1:3, cause a thermite reaction.
 .at a temperature of up to 2400 °C and c.
 .shed with water.

 .m dust is a hazardous material and must be proceed according to the local regulations.
 .eel dust

 /ysical:

 Steel particles can be statically charged and even cold can become an ignition source for the aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignition in source for aluminum dust.
 Typing sparks from steel processing provides the perfect ignit





2

- ⇒ "2.1 Original Joint", page 5
- ⇒ "2.2 Galvanized Body Parts", page 5
- ⇒ "2.3 Remaining Material, Removing", page 5
- ⇒ "2.4 New Parts", page 5
- ⇒ "2.5 Molded Foam Parts", page 6

When repairing, the original joint should always be restored.

Body Repair General Information

Joint*, page 5

d Body Parts*, page 5

Vaterial, Removing*, page 5

varts*, page 6

inal joint should always be restored.

ribed in the repair manual. Further vecause if there are more extensive hould be removed at the original he joining techniques can be imveciding comparison.

g cuts and joining techniques inal joint (production status)

vechnical development team rash testing.

*It was created by the

d when performing

mber of weld

al connection

1. Standard repairs are described in the repair manual. Further descriptions are not given because if there are more extensive repairs, the damaged area should be removed at the original joint. Where this is possible, the joining techniques can be implemented according to the preceding comparison.

All repairs with special separating cuts and joining techniques that do not correspond to the original joint (production status) are checked and approved by the technical development team by evaluating, strength testing and crash testing.

2.1

"Original joint" refers to a connection that was created by the vehicle manufacturer.

These connections should be reconstructed when performing body repairs.

When doing so, ensure that the production number of weld points does not fall short when making repairs.

Methods and procedures differing from the original connection are described in the applicable body repair manual.

2.2

Fully galvanized body parts enable a high level of corrosion protection in body. To maintain the warranty against perforation corrosion even if a repair is required, then the procedures in chapter Refer to ⇒ "11 Corrosion Protection", page 56 must be followed precisely.



CAUTION

When welding zinc-coated sheet steel panels, toxic zinc oxide develops in the welding emissions.

Perform the procedures with extraction.

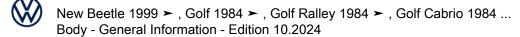
2.3 Remaining Material, Removing

If the damaged body part is cut out roughly, for example using a body saw, based on the separation cuts in the corresponding repair manual, then have most of the spot-welded bonded joints drilled out with the spot weld breaker.

In addition, we recommend the degree sander as well as an angle grinder to remove the weld connections that cannot be removed with the spot weld breaker.

2.4 New Parts

New parts that are no longer accessible after the repair, for example the side sill, should have corrosion protection installed on them before welding for corrosion protection reasons. It is advisable to cover the welding flange when doing so.



Additional information can be found in the paint manual.

Check new replacement parts, such as doors, panels or fenders for transport damage before sending to paint shop. This prevents double painting, if transport or accident damage to the vehicle is noticed during assembly.

Molded Foam Parts

⇒ "2.5.1 Prerequisites", page 6

⇒ "2.5.2 Molded Foam Part, Replacing", page 6

shell and increase in g-oven from approx-wagen AG does not guarantee of added to the correctness of information, for measures.

Iacing

ith butyl sealing

cle.

r) while gently int until it makes

in at least 15 mm
ss)

in the repair area. The molded parts are installed in the body shell and increase in volume after priming them in the paint drying-oven from approximately 180 °C (356 °F). lolkswagen AG.

When using molded foam parts, proceed as follows:

- Remove any remaining foam from the vehicle.
- Create the paint structure according to the paint manual.

2.5.1 **Prerequisites**

Before inserting a molded foam part, the metal part to be replaced must be prepared so that it is ready for installation, for example, cutting, fitting, corrosion protection measures.

2.5.2 Molded Foam Part, Replacing

- Gover the molded foam part all around with butyl sealing cord or two-part filler foam.
- Secure the molded foam part on the vehicle.
- Secure the new part (for example, A-pillar) while gently pressing on it around the molded foam part until it makes contact and then weld it in.
- Do not perform gas-shielded welding within at least 15 mm next to the molded foam part (on both sides)
- After painting the vehicle, seal the cavities in the repair area. Protected by copyright, Copyrig 602



Explanation of Symbols 3

- ⇒ "3.1 Symbols for Removing Components", page 7
- ⇒ "3.2 Symbols for Welding and Soldering", page 7
- ⇒ "3.3 Symbols for Rivets", page 8
- ⇒ "3.4 Symbols for Preparation", page 9
- ⇒ "3.5 Symbols for Corrosion Protection", page 10

Symbols for Removing Components 3.1

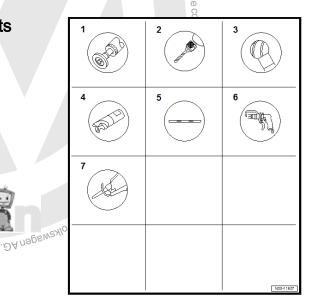
- 1 Grinding / Grinding down to bare surface
- 2 Drilling
- 3 Ball nose end mill
- 4 BTR milling
- 4 BTK ...

 5 Separation Cut

 6 Loosening weld spots

 Sawing

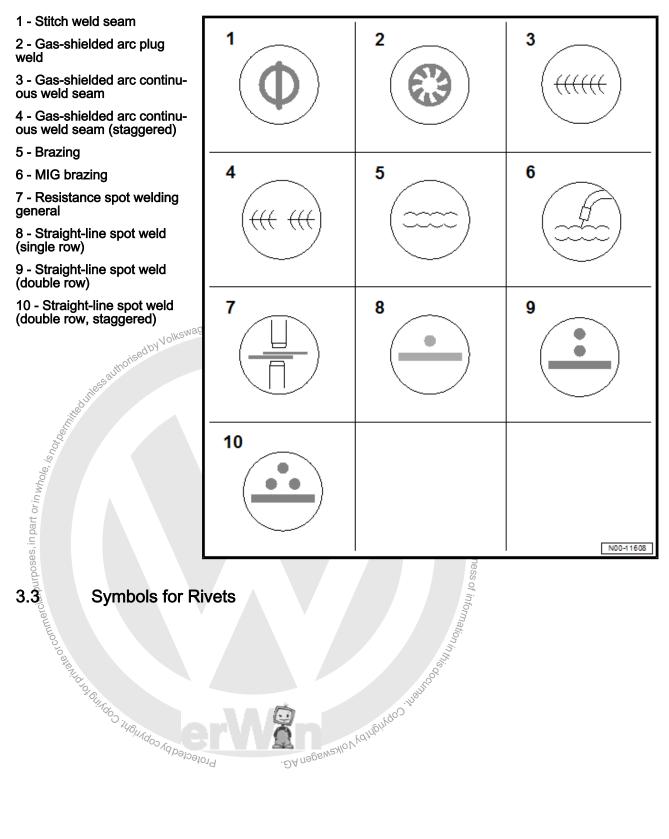
 Republication Agreement



3.2 Symbols for Welding and Soldering



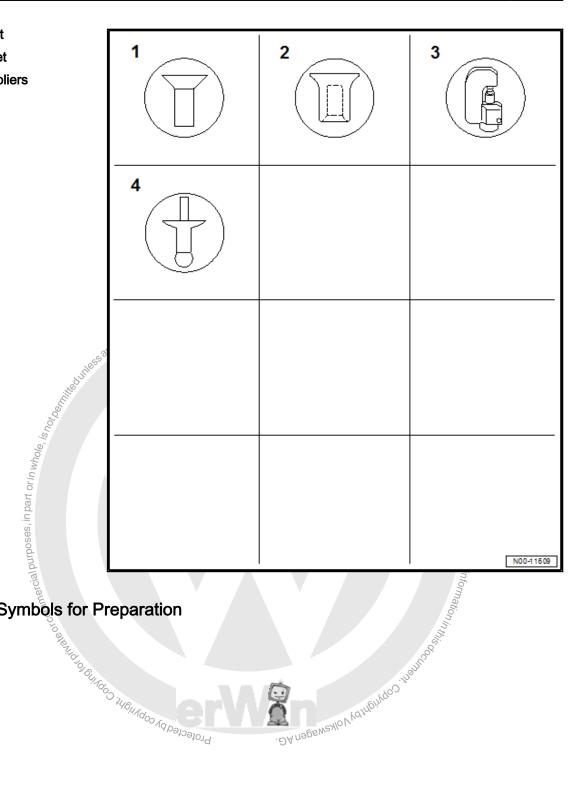
- 1 Stitch weld seam
- 2 Gas-shielded arc plug weld
- 3 Gas-shielded arc continuous weld seam
- 4 Gas-shielded arc continuous weld seam (staggered)
- 5 Brazing
- 6 MIG brazing
- 7 Resistance spot welding general
- 8 Straight-line spot weld (single row)
- 9 Straight-line spot weld (double row)
- 10 Straight-line spot weld (double row, staggered)



Symbols for Rivets



- 1 Solid Rivet
- 2 Punch rivet
- 3 Use rivet pliers
- 4 Pop Rivet



3.4





 1 - Clamping 2 - Setting 3 - Removing paint on hard-to-reach areas 4 - Sanding by hand 5 - Applying adhesive 6 - Setting 	1	2	3
4 - Sanding by hand 5 - Applying adhesive 6 - Setting 7 - Flanging 7 - Flanging 7 - Flanding	4	5	6
ommercial purposes, in part	7		
Signal Top Reputation of the state of the st			N00-11610

Symbols for Corrosion Protection 3.5



1 - Sealing Cavities 2 2 - Sealing Protected by Solving of the Protect of the Solving N00-11611 A negewealow Work opinghi by Volkswagen AG.



Construction Characteristics of Vehicle Body

⇒ "4.1 Multi-Material Mix", page 12

⇒ "4.2 Removal Method on Multi Material Body Repair Station",

⇒ "4.3 Types of Body Construction", page 13

4.1 Multi-Material Mix

In addition to the traditionally pure steel body, there is an increase in mixed-material body construction. This means that a combination of various materials are being used together.



free". For this reason vehicles with steel parts and on which flying sparks from the steel components cannot be completely prevented must NOT be worked on in this area.

The Ruwac NA35 Wet Collection for Explosive Materials VAS 6572/1 (dust class M) from 2009 and the VAS 6572/2 (dust class H) have a 3-part protection against the intake of friction sparks from the possible steel processing. This protection is made of a 5 m (16.4 feet) long antistatic suction hose, the so-called spark trap and a 5 m (16.4 feet) long flow calming section. This ensures that also by unintentional sanding of steel components the glowing sparks are cooled well below the ignition temperature of the aluminum dust. The system has the German Technical Inspection Agency certificate for considerably hotter and longer glowing steel sparks.

A second risk is the static charging of metal particles due to friction in the hoses and pipes during the suction process. This static charge can function as an ignition source in the same way as a glowing spark. To make sure that only the antistatic so called "Ohm hoses" can be installed, the connection coupling



and hoses have an e.

an side.

suction device's possible impact.
the surrounding area. Because this
in industrial vacuum cleaners it autom.
we features for the use in zone 22 and to
vore the surrounding area. Because this
in an official vacuum cleaners it autom.
As a suction device zone work.
For accident repairs the work procedures such
inding and welding automatically produce more
ces than a suction device can.

dust

arks and dust are considered to be risk free. In multi
mixed work stations the steel flying sparks present
atest risk potential for the fine aluminum dust! For this
a and in compliance with the process separation, a steel
um must always be provided which is also allocated to alstremain at the body work station. Generally only aluminum
surums are used because they have a tested spark frap,
this procedure. The Ruwac NA3S Wet Collection for Explosive
Materials VAS 6571/1 is based on the same basic machine as
the VAS 65722, but without a 3-part spark trap. It is suitable for
whe metal dust.

Types of Body Construction

Aluminum Spaceframe
sitic of the spaceframe body is that it has
struction made from aluminum, which
be body. Body shell components, such
sist in this, but they generally do not
rexample, Audir R8).

"We Amarok (Not for
riket)

"generally have a supces the engine, sus"generally weed in



aral Information - Edition 1∟

amage, Evaluating

aral Information", page 14

.eld Seams and Cast Joints, Checking", page 14

.Load Paths", page 14

5.4 Measuring / Damage Diagnosis", page 17

⇒ "5.5 Overview of Materials Used", page 18

⇒ "5.6 Passive Safety Systems", page 23

7.1 General Information

¹ repairing vehicles involved in collisions, damage to the

¹ suspension is not discovered. In some cases, this may

² rious subsequent damage later. In accidents that indi² vy load on the vehicle, the following components

² acked - regardless of whether or not the axles were

ˈ ved:

¹ g and steering linkages using steering wheel

² m-free function, visual inspection for bends

all suspension parts such as control arm,

² ering knuckle, stabilizer bar, subframe,

steners for bends or cracks.

¹ amage, run-out and imbalance.

² ead and the sides and check the

mission, axles and exhaust

¹ re ensures that the vehi² over to the outstomer.

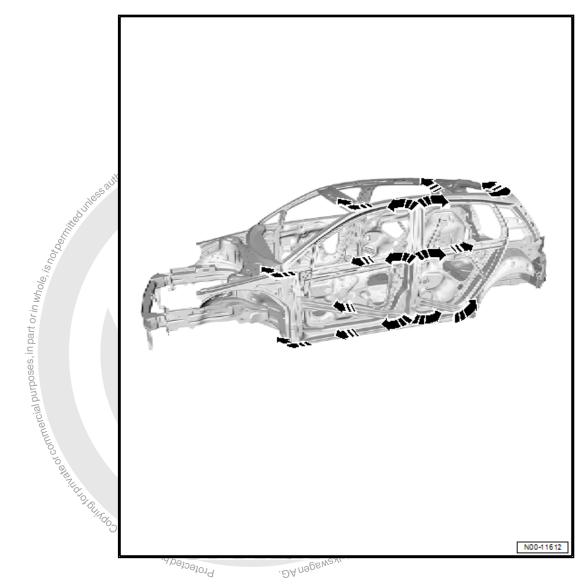
¹ oints, Check
¬ vints, Check
¬



Do not brush the area to be checked before the test; otherwise. the cracks will be smeared.

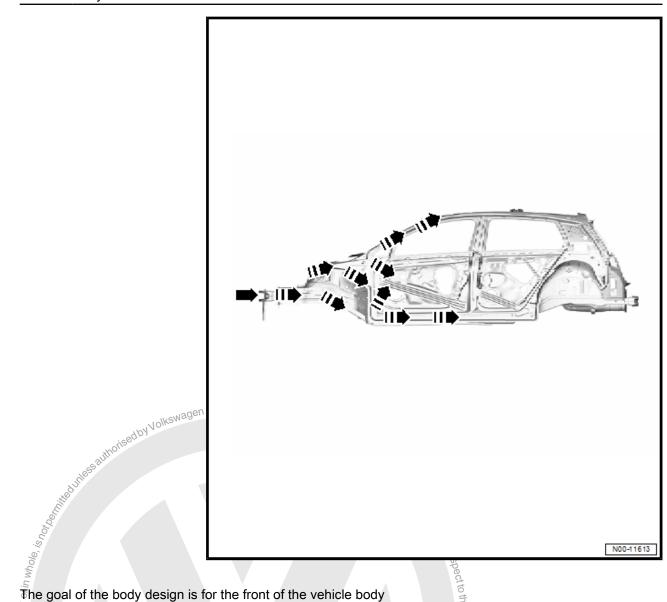
Load Paths 5.3





The image above illustrates how the energy is transferred around the passenger compartment during a side impact. When evaluating the damage, particular attention should be paid to the door side impact protection, as well as the A- and B-pillar connection to the sill and roof frame.

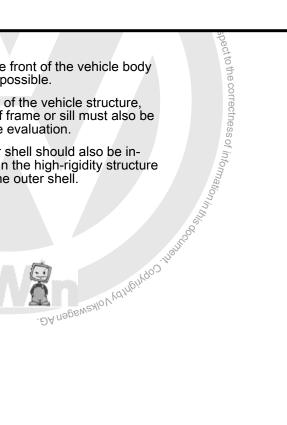




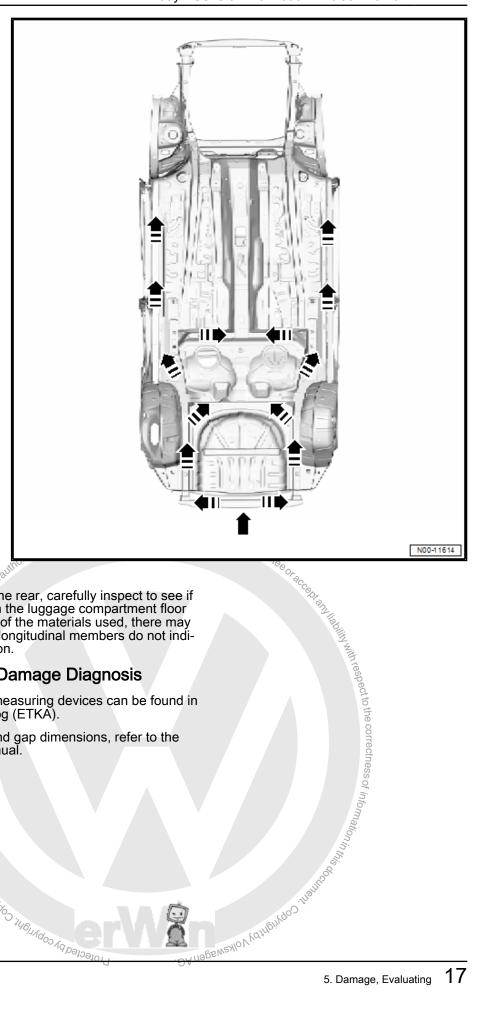
The goal of the body design is for the front of the vehicle body to absorb as much of the energy as possible.

If there is heavy damage to the front of the vehicle structure, the A-pillar transition area to the roof frame or sill must also be closely inspected during the damage evaluation.

Due to the structure, the entire outer shell should also be inspected, since elastic deformations in the high-rigidity structure may cause plastic deformations in the outer shell. Jos to ole Wall of Children Mondoo Va beloelord







When evaluating damage in the rear, carefully inspect to see if there is any metal distortion in the luggage compartment floor area. Due to the spring effect of the materials used, there may be damage, even though the longitudinal members do not indicate any deviation in the longitudinal members do not indicate the second of the longitudinal members. cate any deviation in dimension.

Measuring / Damage Diagnosis

- Information on approved measuring devices can be found in the Electronic Parts Catalog (ETKA).
- For information on body and gap dimensions, refer to the The source of passes of commercial purposes. vehicle-specific repair manual.





New Beetle 1999 \succ , Golf 1984 \succ , Golf Ralley 1984 \succ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

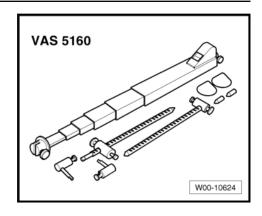
⇒ Body Repair; Rep. Gr. 00; 00; Technical Data

Telescoping Gauge



Note

To quickly diagnose accident damage, it is often sufficient to perform a diagonal comparison measurement using a telescoping gauge.



ability with respect to the correctness of information in this ook,

5.5 Overview of Materials Used

- ⇒ "5.5.1 Important Notes for Deep-Drawn Steel", page 18
- ⇒ "5.5.2 Important Notes for High-Strength and Ultra-High-Strength Steel", page 18
- ⇒ "5.5.3 Important Notes for Aluminum", page 19
- ⇒ "5.5.4 Contact Corrosion", page 20
- ⇒ "5.5.5 Important Notes for Carbon Fiber-Reinforced Polymer (CFRP)", page 20
- ⇒ "5.5.6 General Plastic Characteristics", page 23

5.5.1 Important Notes for Deep-Drawn Steel

Body and floor assembly in series production are produced predominantly from cold-formed deep-drawing sheet metal. For this reason, reshaping accident damage should be carried out in the same way. If the size of the damage does not allow it to be reshaped against the direction of damage, the damaged part must be removed after straightening, the connecting surfaces.

5.5.2 Important Notes for High-Strength and Ultra-High-Strength Steel

High-strength steel panels are being used increasingly in our vehicles. You can see the areas where these panels are used in an image in the body repair manual. Refer to \Rightarrow Rep. Gr. 00.

What are high-strength panels?

Optically normal panels, but they have a higher yield point than normal body panels because of various alloys. This means, with the same force applied to the panel, the dent in the high-strength panel is not as deep as that in a normal body panel.

What must be observed when removing dents?

Dents are removed with standard tools. Due to the higher dent resistance, there is greater rebound so that it may be necessary to expend more force. When buckled areas are reshaped, breaks in the material may occur.

What must be observed when straightening with a bench-type straightening system or hydraulic press?

Due to the greater rebound characteristics of high-strength panels, it must be stretched more than a normal panel before it remains in the desired position. Due to the higher application of force, normal panels that are welded with high-strength panels are strained more. In order to prevent normal panels from yielding or tearing, an additional anchorage must be provided.

Nolkswagen

Totectedby





What are ultra-high-strength hot-formed steel panels?

New Beetle 1999 ➤ , Golf 1984 ➤ , Golf Ralley 1984 ➤ , Golf Cabrio 1984 Body - General Information - Edition 10.2024	(
Note						
If a high-strength panel is stretched too much, it suddenly AG does not springs back a lot unintentionally! Note: The suddenly AG does not give the subject to the subjec						
For safety reasons, high-strength body panels must not be heated when reforming as with normal body panels!						
Welding high-strength steel according to the repair manual with the specified separation cuts and welding procedures is permitted.						
What are ultra-high-strength hot-formed steel panels?						
New Beetle 1999 ➤ , Golf 1984 ➤ , Golf Ralley 1984 ➤ , Golf Cabrio 1984 Body - General Information - Edition 10.2024 If a high-strength panel is stretched too much, it suddenly a springs back a lot unintentionally! For safety reasons, high-strength body panels must not be heated when reforming as with normal body panels! Welding high-strength steel according to the repair manual with the specified separation cuts and welding procedures is permitted. What are ultra-high-strength hot-formed steel panels? They are steel panels that, as their name suggests, are formed in a warm condition at temperatures between 900 °C and 950 °C (1.652 °F and 1.742 °F). The steel panels gain their high strength through a specific cooling process in the reshaping tool. They are form hardened. The vehicle weight can be reduced without losing strength by using ultra-high-strength hot-formed steel panels. On vehicles with ultra-high-strength hot-formed steel panels used: Description Yield points Normal steel panel < 160 MPa (N/mm²) High-strength steel panel < 220 MPa (N/mm²) Ultra-high-strength steel panel < 220 MPa (N/mm²) Ultra-high-strength steel panel < 1000 MPa (N/mm²) Ultra-high-strength steel panel < 1000 MPa (N/mm²) Ultra-high-strength hot-formed °×1000 MPa (N/mm²) Steel panel James of the panel of the						
Yield points of steel panels used:						
Description Yield points						
Normal steel panel < 160 MPa (N/mm²)						
High-strength steel panel < 220 MPa (N/mm²)						
Extra-high-strength steel panel < 420 MPa (N/mm²)						
Ultra-high-strength steel panel < 1000 MPa (N/mm²) Ultra-high-strength hot-formed >1000 MPa (N/mm²) steel panel						
5.5.3 Important Notes for Aluminum						
Aluminum is largely used in modern vehicle bodies to reduce						

5.5.3 Important Notes for Aluminum

Aluminum is largely used in modern vehicle bodies to reduce weight and to increase body stiffness.

In vehicle construction, a distinction is made between:

- Aluminum sheet metal
- Aluminum extrusion profiles (may not be reformed)
- Aluminum cast parts (may not be reformed)

The properties of these components are fundamentally different. If there is damage, pay attention to the vehicle-specific repair manuals.



Note

- The following instructions only apply to conventional steel vehicles on which aluminum metal parts are installed.
- You can see the areas where these panels are used in an image in the respective body repair manual. Refer to ⇒ Rep. Gr. 00.



New Beetle 1999 ➤ , Golf 1984 ➤ , Golf Ralley 1984 ➤ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024



Note

- Use tools for either steel or aluminum.
- Recommendation: special aluminum tool kit in tool cart

5.5.4 **Contact Corrosion**

Joseph Marketo The State of the Contact corrosion may occur if unsuitable connecting elements (bolts, nuts, washers and etc.) are used. For this reason, only fasteners with a special surface coating may be installed. In addition, rubber and plastic parts and adhesive are made of non-conductive materials. If there is any doubt as to whether parts should be reused, always install new parts.



Note

- Only use original replacement parts. They have been checked and are compatible with aluminum.
- Accessories must be approved by Volkswagen AG.
- If unapproved materials are used, contact corrosion damage is not covered under warranty.

Important Notes for Carbon Fiber-Rein-5.5.5 forced Polymer (CFRP)



Note

Work on the carbon fiber reinforced polymer (CFRP) areas

Work on ... should only be done ...,

Occupational Safety

When working on CFRP components make sure there is enough protective equipment.



20



Evacuation must be used. Acceleration of work by raising the parameters can pose a health risk, when vapors, smoke or dust

Personal protective equipment must be used.

- 1 Safety Gloves
- 2 Protective Eyewear
- 3 Protective Apron
- 4 Mask



Carbon fiber-reinforced polymer (CFRP) properties:

CFRP is an abbreviation for carbon fiber-reinforced polymer.

Fiber diameter = approximately 6µm

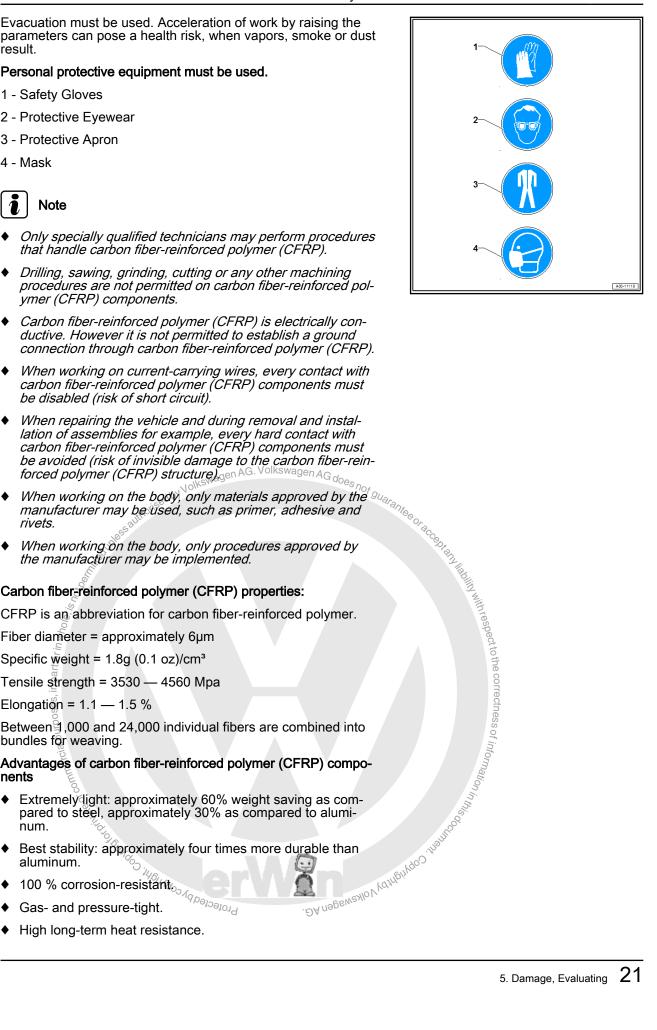
Specific weight = 1.8g (0.1 oz)/cm³

Tensile strength = 3530 — 4560 Mpa

Elongation = 1.1 — 1.5 %

Between 3,000 and 24,000 individual fibers are combined into bundles for weaving.

Advantages of carbon fiber-reinforced polymer (CFRP) components





Hardly measurable thermal expansion

Disadvantages of carbon fiber-reinforced polymer (CFRP) components

- Very expensive material.
- Difficulty evaluating material if damaged. Damage, such as cracks that are not visible to the human eye, require the use of thermal imaging, infrared and X-ray procedures.
- Repairing structure-relevant carbon fiber-reinforced polymer (CFRP) components is generally not permitted; components must be replaced.

Special notes on using carbon fiber reinforced polymer (CFRP) in production vehicles:

When used in vehicles, the properties must be carefully considered with regard to widespread maintenance servicing by workshops. CFRP components forgive damage less than metal. If a component is damaged it must be replaced. To prevent damage to the remaining components in the vehicle, do not use force or large amounts of strength. Use the specified tools. Pay close attention to the procedure and parameters, as they ensure damage-free work. Patience and care for this work is of the utmost importance.

Not all carbon fiber-reinforced polymer (CFRP) is the same.

Unlike metals the characteristics of CFRP material are not generally visible. The characteristics are example specific. Depending on the resin, fibers, fiber direction and many other factors the components behavior is independent.

Deformation behavior

CFRP components can be constructed so that they displace energy. As a result, they burst or they secure the safety cell during a collision. They can be deigned to be deformable from the construction. It is very important to pay attention to and follow the instructions for each component.

Elasticity after application of force

ACFRP component can be deformed through the load, show breaks or inner damage. After removal of the load a spring back is possible. If this is the case an evaluation of the component is very critical, when this has to do with inner components.

Detecting damage

o recording the period of the correctness of information in this contract of the correctness of the correctn Cracks, scratches and fiber breakage can be assessed from the outside. When the rear side is visible, impact damage can be partly determined. A delamination (layer separation) that may have occurred through an impact reduces the component strength, the bending strength and thus the breaking and component rigidity of the laminate. Because it is not possible to extremely important damage diagnosis is

Radiography = computed tomography (CT) uenewship have been shown to the computed to the computed tomography (CT) uenewship have been shown to the computed tomography (CT) uenewship have been shown to the computed to evaluate the damage of CFRP components based solely on a visual inspection and the properties of the components can be drastically worsened by slight damage, it is extremely important to conduct a careful inspection before a damage diagnosis is

Overview of nondestructive inspection methods

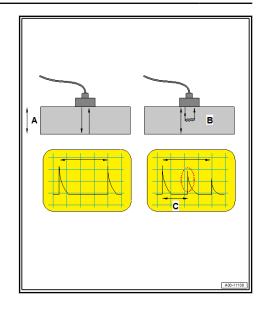
- Thermal = thermography
- Electrical / magnetic = eddy current testing



Audi AG uses the ultrasonic method for diagnosing carbon fiber-reinforced polymer (CFRP) components.

The test sends ultrasonic sound pulses with a very short duration (1-10 µs) that pass through the test component. The sound pulses are reflected by the rear wall and return to the test probe as an echo. Compare the data with the data of a malfunction free part

- A Material thickness
- B Error in component
- C Error depth



5.5.6 **General Plastic Characteristics**

The areas where plastics are used are very diverse. Property and repair information can be found in the vehicle-specific repair manual, or in the plastic repair chapter: Refer to ⇒ "12 Plastic Repair", page 58

5.6 Passive Safety Systems

- ⇒ "5.6.1 Restraint Systems (Seat Belt Systems)", page 23
- ⇒ "5.6.2 Belt Tensioners, Safety Precautions", page 24
- ⇒ "5.6.3 Working on Vehicles With Belt Tensioners", page 24
- ige 24

 ints",

 Jolkswagen AG, Volkswagen AG does not guarantee of accept a ⇒ "5.6.4 Disposal of Undeployed Pyrotechnic Components", page 25
- ⇒ "5.6.5 Restraint Systems (Airbag Systems)", page 25
- ⇒ "5.6.6 Important Notes when Working on Seats with Side Airbag", page 26
- ⇒ "5.6.7 Instructions for Disposal", page 26

5.6.1 Restraint Systems (Seat Belt Systems)



Note

- The seat belt system must be inspected systematically after every accident.
- If damage is determined at any inspection point, the customer must be informed that it is necessary to replace the seat belt.

Inspection items:

- Check the seat belt webbing. Refer to ⇒ Body Interior; Rep. Gr. 00 ; Safety Precautions; Seat Belt Webbing, Checking .
- Check the belt retractor (locking function). Refer to ⇒ Body Interior; Rep. Gr. 00; Safety Precautions; Automatic Belt Retractor (Locking Function), Checking
- Visually inspect the seat belt latch. Refer to ⇒ Body Interior; Rep. Gr. 00; Safety Precautions; Seat Belt Latch, Visually Inspecting. Protectedby





If customer refuses to have a damaged seat belt replaced, appropriate note should be made.

5.6.2

- Belt tensioner units that are mechanically damaged (dents, must always be replaced.
- Belt tensioner units should be installed immediately after removing them from the shipping package.
- The belt tensioner unit is to be returned to shipping package when work is interrupted.
- It is not permitted to leave the belt tensioner unit unattended.
- The belt tensioner unit may not be treated with lubricant, cleaning agents, or similar materials, and may not be exposed, even briefly, to temperatures above 100 °C (212 °F).

5.6.3 Working on Vehicles With Belt Tensioners



Note

Before beginning separation work, straightening work and/or dent removal, remove mechanically activating belt tensioners without load detection (release lock). With electrically activating belt tensioners, the battery ground cable must be disconnected.



Note

If the belt webbing is completely unrolled, the load detection (release lock) hinders the release of the mechanically activated belt tensioner in an accident.





Note

- g for proper reations. If there ter.

 Vent can be With belt tensioners with load detection, the belt webbing must not be pulled out when performing separation work, straightening work and/or dent removal. If strong vibrations are generated by separating work, straightening work or dent removal, the belt tensioners with load detection must be removed.
- Information can be found in the vehicle-specific repair manuals. Refer to ⇒ Body Interior Rep. Gr. 69 ; Passenger Protection; Seat Belts .

Disposal of Undeployed Pyrotechnic 5.6.4 Components

- Airbags,
- Seat belts,
- Pyrotechnic battery cut-out elements,
- ◆ Active front lid release unit

These must be returned in their original packaging for proper recycling/disposal in accordance with national regulations. If there are any questions, contact the distributor or importer.



Note

Pyrotechnic components deployed in an actual accident can be disposed of as industrial waste.



Note

- This does not apply to seat belt tensioner that function ac cording to the "Wankel tensioner principle".
- These should be handled like undeployed pyrotechnic components, because they cannot be checked using service equipment if all pyrotechnic materials have deployed.

5.6.5 Restraint Systems (Airbag Systems)

Refer to the vehicle-specific repair manuals for all procedures on the airbag systems. Refer to ⇒ Body Interior; Rep. Gr. 69 Airbag System; Component Location Overview - Airbag System as well as the corresponding safety precautions in ⇒ Body Interior; Rep. Gr. 00; Safety Precautions; Safety Precautions when Working on Pyrotechnic Components.





Note

- The battery ground cable must be disconnected when working on the airbag system or when performing alignment work during body repairs.
- Switch off ignition before connecting battery!
- There should not be any people inside the vehicle when connecting the battery!
- Airbag components must not be exposed to temperatures over 100 °C (212 °F), even if for a short period of time.
- Airbag components must not come in contact with grease, cleaning materials, oil, or similar substances.
- Mechanically damaged airbag components must be replaced.
- Wash hands after touching deployed airbag units.

5.6.6 Important Notes when Working on Seats with Side Airbag

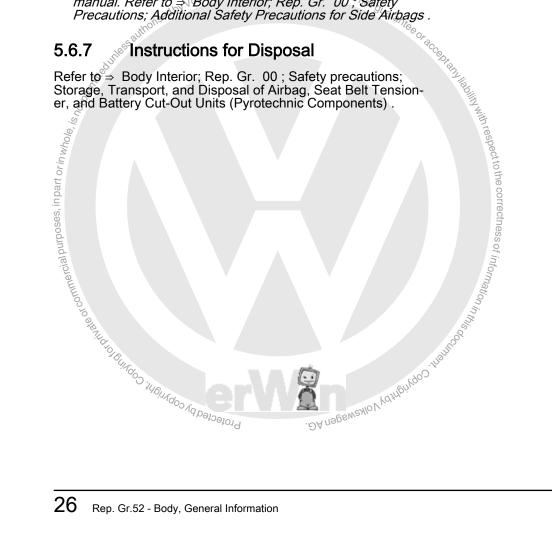


Note

- The safety precautions must always be followed when removing the seats.
- Follow the safety precautions from the vehicle-specific repair manual. Refer to > Body Interior; Rep. Gr. 00 , Safety Precautions; Additional Safety Precautions for Side Airbags

5.6.7 Instructions for Disposal

Refer to ⇒ Body Interior; Rep. Gr. 00; Safety precautions; Storage, Transport, and Disposal of Airbag, Seat Belt Tensioner, and Battery Cut-Out Units (Pyrotechnic Components).





6 Thermal Joining Techniques

- ⇒ "6.1 Resistance Spot Welding", page 27
- ⇒ "6.2 Gas-Shielded Plug Welding", page 28
- ⇒ "6.3 Gas-Shielded Arc Continuous and Stitch Weld Seams", page 29
- ⇒ "6.4 MIG Soldering", page 29
- ⇒ "6.5 Aluminum Welding", page 30
- ⇒ "6.6 Laser Welds", page 30
- ⇒ "6.7 Laser Soldering", page 31
- <u>"6.8 Replacement Joining Procedures in Repair (Steel)", page</u>
- ⇒ "6.9 Replacement Joining Procedures in Repair (Aluminum)", page 32

The thermal joining techniques currently used in procedures are presented in the following chapter.

**The thermal joining techniques currently used in procedures are presented in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently used in the following chapter.

**The thermal joining techniques currently The thermal joining techniques currently used in body repair

The basic principle for repair welding is to re-create as much of $q_{p_{\Theta_{l}}}$ the original welded connection as possible.

This requires that:

- The panels to be welded overlap.
- Both sides of the weld point are accessible to the electrodes.
- The resistance spot welder is strong enough to produce weld spot diameters like at the factory.

During body repair work, access to weld points varies. Therefore, each resistance spot welder must have a complete set of the most common types of electrodes.

Zinc-Coated Panels, Straight-Line Welding

When performing resistance spot welding on zinc-coated panels, observe following points:

- The flanges to be spot welded must touch. If necessary, tension the flanges with pliers.
- This is especially important with high-strength panels because the electrode strength is not great enough.
- Do not weld directly by the clamping pliers with the welding tongs because a large amount of the welding current flows through here due to shunting.
- With small spot weld spacing, weld points in a sequential order or weld every third point to secure, then finish welding. This minimizes the shunting influence.
- Observe Owner's Manual and adjustment notes from manufacturer.





New Beetle 1999 ➤ , Golf 1984 ➤ , Golf Ralley 1984 ➤ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

Devices

Only the devices approved in the Workshop Equipment Catalog may be used.

Test Button Weld

- For the necessary button weld diameter, determine the panel pairing based on the manufacturer's specifications and check with test panels.
- Check all spot weld connections 100% with a chisel test.

Qualitatively acceptable spot welds do not tear into the contact welds surface, but rather "unbutton".

Calculate the button weld diameter with the following formula and check on test panels before beginning repair.

Square root of T1*3,5*1,15



Note

T1 is the thinnest panel in a panel combination, for example, panel combination of 1.5 mm and 0.8 mm. Example calculation: root of 0.8 x 3.5 x 1.15 = 3.6 mm button weld diameter. With the test, the small welded test strip is rolled or pulled from the second test strip with force perpendicular to the panel surface.

Devices

Only the devices approved in the Workshop Equipment Catalog may be used.

Welding and sanding must be carried out with ventilation.

Never weld and sand in any area at the same time.

Clean the work area regularly depending on the amount of dust.

Do not blow out the accumulated with compressed air.

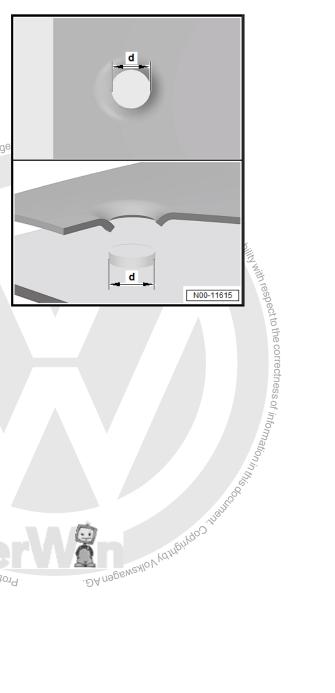
Empty the extraction system and seed.

Follow all country-specific regulations regarding accident pre-

6.2 Gas-Shielded Plug Welding

Gas-shielded plug welding is mostly used when the standard implemented resistance spots cannot be recreated, for example due to limited accessibility.

Always refer to the vehicle-specific repair manuals for this.



 $_{
m i}$ to the correctness of informal



General Information regarding Gas-Shielded Plug Welding

- Loosen weld spots with spot weld cutter or sand off.
- Remove the damaged part, separate with a chisel if necessary.
- Sand down projections.
- Adapt the new part.
- Drill the top panel for plug welding (refer to the vehicle-specific repair manual for the drill bit diameter).
- Clean the flanges and remove the oxide coating.
- Perform plug welding from center outward.



Note

Riveting are also permitted, to some extent. Observe the body repair repair manual.

Devices

Only the devices approved in the Workshop Equipment Catalog may be used.

6.3 Gas-Shielded Arc Continuous and Stitch Weld Seams

Gas-shielded arc continuous and stitch weld seams are primarily used when joining butt-welded or overlapping separating points. Due to the very high welding temperatures and the altered material properties associated with it, there is increasingly limited use of this joining process. Always refer to the vehicle-specific repair manuals for this.

Devices

commercial purposes, in part or in whole, is n.

Only the devices approved in the Workshop Equipment Catalog may be used.

6.4 MIG Soldering

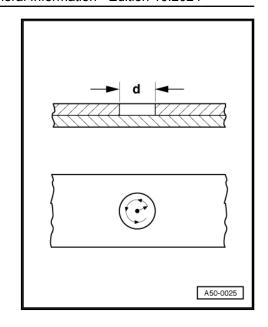
MIG soldering primarily differs from the gas-shielded arc stitch or continuous weld seam in that it requires significantly lower temperatures. The advantage of MIG soldering is a significant reduction in material distortion in the components being connected. The joining process is also suitable for larger flat components.

Other advantages include:

- Minimal structural changes in the components.
- Minimal damage to the corrosion protection applied during production.
- Preserves the zinc coating on the components.

What is MIG soldering?

- Brazing procedures are also called gas-shielded metal soldering.
- The base material (body panel) is not melted on; the solder coats the flanks and connects the components.
- MIG stands for metal inert gas. The inert gases are not actively involved in the processes between the electric arc and welding filler material.





New Beetle 1999 ➤ , Golf 1984 ➤ , Golf Ralley 1984 ➤ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

- Argon or helium are among the inert gases to be used, and are mixed with carbon dioxide or oxygen.
- Up to 450 °C: solder Above 450°C: braze

Devices

Only the devices approved in the Workshop Equipment Catalog may be used.

6.5 **Aluminum Welding**

Metal Inert Gas (MIG) welding is used by the manufacturer and in service.

Argon is used as inert gas.

- Before welding, remove any underbody protection and paint from the components.
- Then remove the approximately 40 mm of the oxide layer on both sides using a stainless steel brush.
- To avoid formation of cracks, weld seams must be drawn around section corners.



Note

- Use the Panel 4D0 898 103- for welding practice and re-
- Additional information can be found in the "aluminum welding" training guide.

Same Material, Underlying

Same material -C- is created from remainder of new -B- or old parts -A-. Same material should also be underlaid on beaded panel edges. On small cross sections or large panel edges, the same material is separated.

Bevel both panels 45°. Round outer edge (radius = 3) and Protected by cop chamfer inner edge.

Panel tips must be 3 to 4 mm apart.

Devices

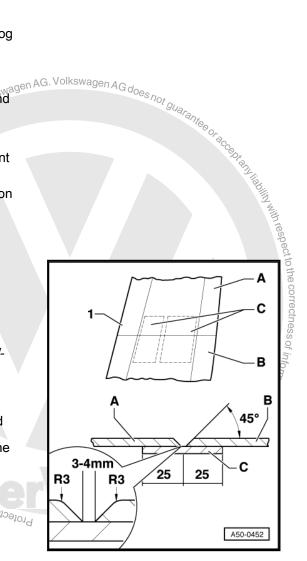
Only the devices approved in the Workshop Equipment Catalog may be used.

Laser Welds 6.6



Note

This joining procedure is only used during manufacture.

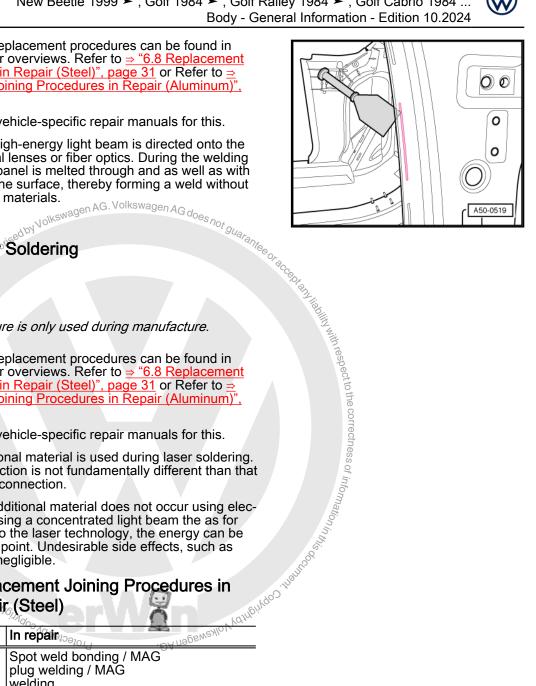




Information on the replacement procedures can be found in the following chapter overviews. Refer to ⇒ "6.8 Replacement <u>Joining Procedures in Repair (Steel)</u>, page 31 or Refer to ⇒ "6.9 Replacement Joining Procedures in Repair (Aluminum)", <u>page 32</u>

Always refer to the vehicle-specific repair manuals for this.

In laser welding, a high-energy light beam is directed onto the weld point via optical lenses or fiber optics. During the welding process, the upper panel is melted through and as well as with the lower panel on the surface, thereby forming a weld without using any additional materials.



Laser Soldering 6.7



Note

This joining procedure is only used during manufacture.

Information on the replacement procedures can be found in the following chapter overviews. Refer to ⇒ "6.8 Replacement Joining Procedures in Repair (Steel)", page 31 or Refer to ⇒ "6.9 Replacement Joining Procedures in Repair (Aluminum)", page 32.

Always refer to the vehicle-specific repair manuals for this.

Generally, an additional material is used during laser soldering. The soldered connection is not fundamentally different than that of an MIG soldered connection.

Only the fusing of additional material does not occur using electric arc, but rather using a concentrated light beam the as for laser welding. Due to the laser technology, the energy can be applied at a precise point. Undesirable side effects, such as heat distortion, are negligible.

Replacement Joining Procedures in 6.8 Repair (Steel)

	MAD KON						
In production	In repair, and the state of the						
Spot welds	Spot weld bonding / MAG plug welding / MAG welding						
MAG Welding	MAG Welding						
MIG Soldering	MAG Welding						
Laser Welds	MAG Welding						
Laser Soldering	MIG soldering Bonding MAG welding Pay attention to information in repair manual						
Bonding	Bonding / MAG welding						
Spot weld bonding	Bonding with spot welding / additional spot welds / additional MAG welding						
Pop rivets	Pop rivets Only use pop rivets specified in the repair manual. Commercially available pop rivets generally do not have sufficient strength.						



6.9 Replacement Joining Procedures in Repair (Aluminum)

In production	In repair
MIG welding	MIG welding
Spot welds	Not used
MIG Soldering	Not used
Laser Welds	Bonding and riveting
Bonding	Bonding and riveting
Punch Rivets	Punch Rivets
Pop rivets	Pop rivets Only use pop rivets specified in the repair manual. Commercially available pop rivets generally do not have sufficient strength.





7 **Cold Joining Procedures**

- ⇒ "7.1 Bonding", page 33
- ⇒ "7.2 Rivets", page 35
- ⇒ "7.3 Overview of Rivet Heads", page 39
- ⇒ "7.4 Rivets and Tools Overview", page 40
- ⇒ "7.5 Flow-Drill Bolts", page 45
- ⇒ "7.6 Clinching", page 47

7.1

⇒ "7.1.1 Aluminum Bonded Joints, Creating", page 33

To increase body stiffness and strength, adhesive and spotweld bonded joints are being increasingly used in production.

They are differentiated as follows:

- In purely bonded joints, the sheet metal parts are only bonded by adhesive.
- For adhesions with additional spot or rivet connections, one may refer to them as hybrid bonding.



Note

The bonded joints may only be restored with the materials specified in the repair manual or replacement parts catalog.

7.1.1



Note

The following descriptions do not replace the vehicle-specific repair manual.

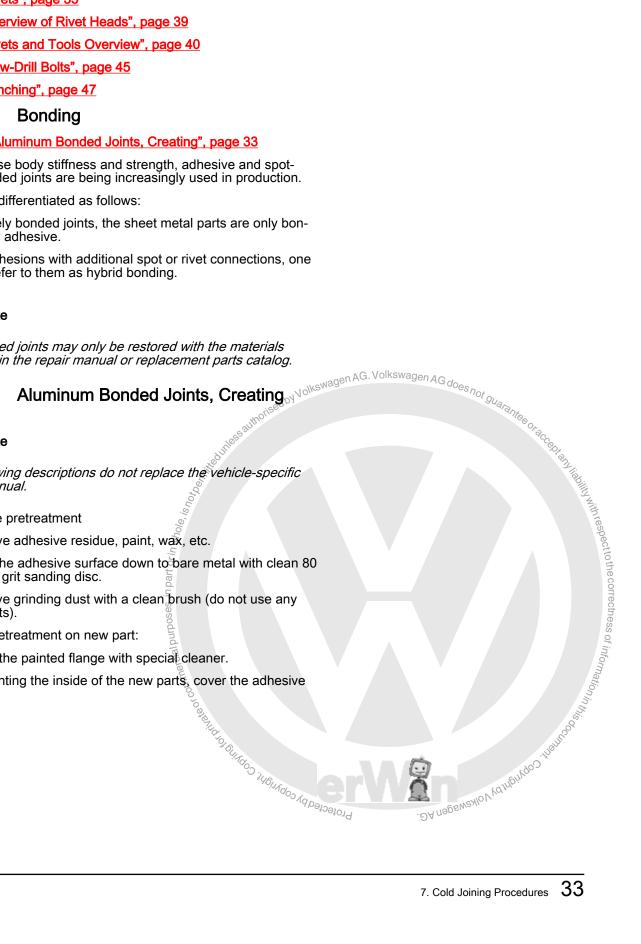
Old flange pretreatment

- Remove adhesive residue, paint, wax, etc.
- Sand the adhesive surface down to bare metal with clean 80 or 100 grit sanding disc.
- Remove grinding dust with a clean brush (do not use any solvents).

Flange pretreatment on new part:

Clean the painted flange with special cleaner.

When painting the inside of the new parts, cover the adhesive surfaces.





New Beetle 1999 ➤ , Golf 1984 ➤ , Golf Ralley 1984 ➤ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

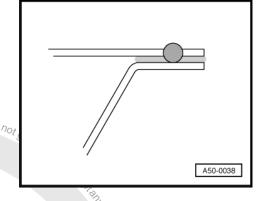
Apply adhesive to the body side, fit the components and secure. Adhesive bead: 3.5 mm.

Fit and secure the components within the processing time specified by the adhesive manufacturer; otherwise, the adhesion strength on the flanges will be insufficient due to a buildup of film on the surface.

Install rivets and wipe away escaping adhesive.

Install rivets and wipe away escaping adhesive. The sales adhesive. The The rivets must be tightened before setting the adhesive. The available times are therefore dependent on the ambient temper-

Always note the specifications on the technical data sheet for the adhesive.





Note

If the adhesive escapes on both sides along the entire length, too much was applied.

The adhesive must harden before any other surface treatment.



Note

- On large parts, such as the roof, it is necessary to perform the work with a helper. Otherwise the adhesive will dry before work is complete.
- Before positioning the mixing nozzle, make sure the double cartridge openings are clean. Firmly install the mixing nozzle and press out a bead about 10 cm long and apply adhesive.
- An DA negs we Allo V Ved in the conceptuality of information in the standard of information i After breaks up to 30 minutes, press out a bead about 10 cm long so that new material is mixed. After breaks over 30 minutes, replace mixing nozzle and press out a 10 cm long bead. If more carriages be treated with a mixing nozzle. Of population of the treated with a mixing nozzle. bead. If more cartridges are needed for a repair, these can

Devices

Only the devices approved in the Workshop Equipment Catalog may be used.



Note

- Wear protective gloves and eyewear.
- Avoid direct contact of the adhesives with the skin.
- Avoid inhaling solvent vapors.
- Only process adhesives in well-ventilated areas.
- Always note the hazard information from the manufacturer.
- Also note the accident prevention regulations applicable in the respective country.
- Note the corresponding safety data sheets for the adhesive.



7.2 **Rivets**

- ⇒ "7.2.1 Solid Rivet", page 35
- ⇒ "7.2.2 Pop Rivet", page 36
- ⇒ "7.2.3 Rivet Problems", page 37
- ⇒ "7.2.4 Kerb-Konus Rivets", page 39



Note

Please refer to the vehicle-specific repair manuals or the Workshop Equipment Catalog for information on required special tools, testing equipment, and tools.

Make sure there is corrosion protection before riveting. Refer to ⇒ Paint General Information Passenger Vehicle; Rep. Gr. 00; General Information; Corrosion Protection for Body, Attachments and Welded Parts .

7.2.1 Solid Rivet

Opening the solid rivet

- First make separating cuts, if necessary.
- Sand off closing head and press out the solid rivet with the rivet tool.
- Remove the damaged part, separate with a chisel if neces-Protectedbycop sary.

A50-0030

Solid Rivet, Installing

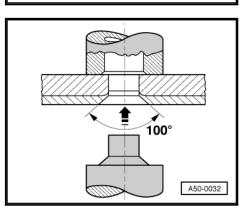
- Fit new parts, apply adhesive and place new part on body and secure.
- Stamp the flange with the rivet tool.

When stamping, the punch hole and the imprint are made in one process.



Note

Adjust the rivet tool to material thickness for all procedures. To prevent flange from gaping after stamping, insert staples in the punched holes.





New Beetle 1999 \succ , Golf 1984 \succ , Golf Ralley 1984 \succ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

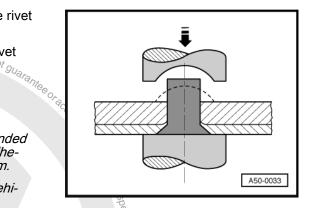
 Insert the solid rivet and affix the closing head using the rivet tool.

There are corresponding rivet tool inserts for the various rivet diameters.



Note

- ◆ Contrary to the series, all rivet connections are also bonded in service. Refer to ⇒ "7.1 Bonding", page 33 for the adhesive connection. The solid rivet is made out of aluminum.
- There are different solid rivets available. Refer to the vehicle-specific instructions for this.



7.2.2 Pop Rivet

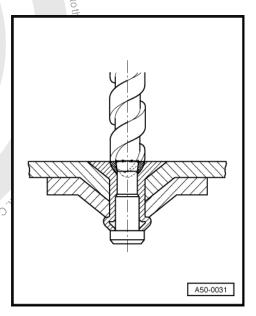
Opening the pop rivet

- First make separating cuts, if necessary.
- Driff out the pop rivet, drill bit diameter 4.5 mm.
- Remove the damaged part, separate with a chisel if necessary.



lote

Catch pop rivet remnants. If remnants fall into the cavities and can no longer be removed, they must be worked into the filler wax.



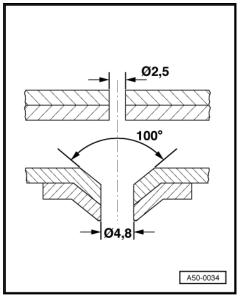
Pop Rivet, Installing

- Fit new parts, place on body and secure.
- Drill old and new part or same material together, 2.5 mm diameter.
- Remove the new parts.
- Imprint drilled holes in all parts with rivet tool.



Note

- Adjust the rivet tool to material thickness for all procedures.
 The diameter increases to 4.8 mm with imprinting. The imprint must face inward on all parts.
- Assembly sections cannot be imprinted. Lower the new part with assembly section, remove part and drill out the assembly section to 4.8 mm diameter.
- Apply the adhesive.



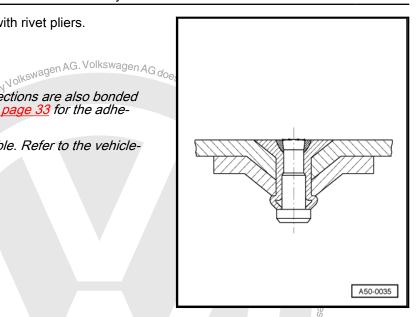


Insert the pop rivet and pull the pin with rivet pliers.



Note

- ◆ Contrary to the series, all rivet connections are also bonded in service. Refer to <u>⇒ "7.1 Bonding", page 33</u> for the adhesive connection.
- There are different popyivets available. Refer to the vehiclespecific instructions for this.



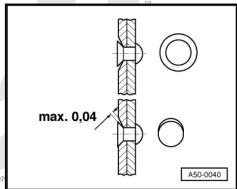
7.2.3 Rivet Problems

Open countersinks

Open countersinks over the entire circumference are not permitted. Partially open countersinks up to a gap width of 0.04 mm are permitted.

Sizing, for example, with a cambered die, is permitted as long as the tolerance for closing and setting head are maintained.

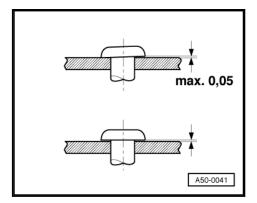




Non-fitting rivet heads

Loose rivets are never permitted.

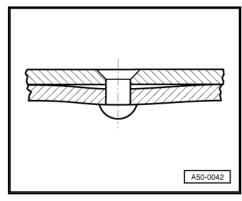
A partial gap up to 0.05 mm is permitted.

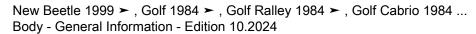


Bulges at the rivet connection

During the riveting process, the rivet material is pushed into the gap and causes bending stress to the rivet.

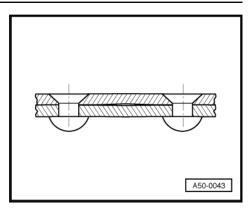
This type of bulge is not permitted.





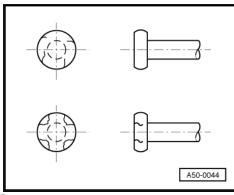
Bulges between the rivet connections

Bulges may not exceed a gap width of 0.3 mm.



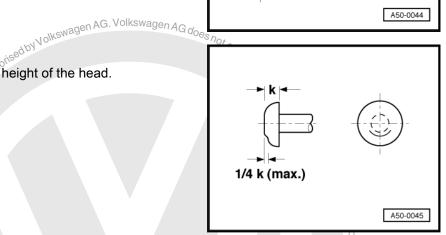
Shear cracks

Cracks that do not overlap are permitted (top).



Notches

The permitted notch depth is 1/4 height of the head.



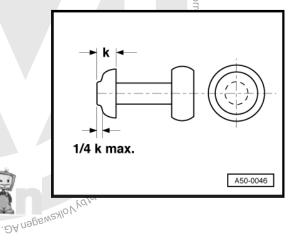
Rings

Rings form in the head when a riveting header is used that is too small.

The permitted depth of the rings is 1/4 * height of the head.

OSPANIA OO SHOINGOO VA DOSOOSON

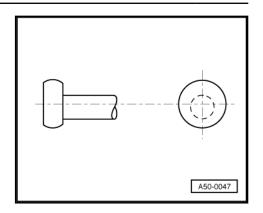
The fully formed ring is not permitted.





Offset closing head

An offset head is not permitted if the head touches the shaft and the rivet hole is visible.



7.2.4 **Kerb-Konus Rivets**

Kerb-Konus rivets coated with stainless steel are inserted.



Note

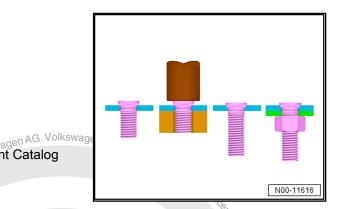
Due to the corrosion risk, stainless steel rivets may not be drilled out or sanded.

Riveting processes

- A Setting the rivet
- B Pressing process
- C Inserting and punching out
- D Finished Kerb-Konus rivet connection

Devices

Only the devices approved in the Workshop Equipment Catalog may be used.

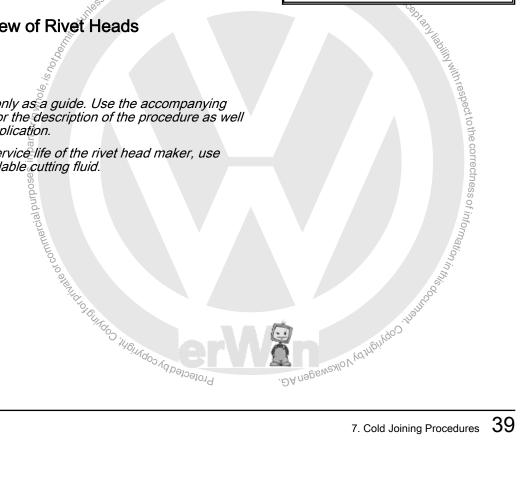


Overview of Rivet Heads 7.3



Note

- This card serves only as a guide. Use the accompanying Owner's Manual for the description of the procedure as well as the areas of application.
- To increase the service life of the rivet head maker, use commercially available cutting fluid.





New Beetle 1999 \succ , Golf 1984 \succ , Golf Ralley 1984 \succ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

D 1 + D 2 - 3.2 mm Diameter Press - Punch Rivet

D 2 + D 3 - 3.2 mm Diameter Press - Punch Rivet

D 2 + D 5 - 5 mm Diameter Press - Punch Rivet

D 3 + D 5 - 5 mm Diameter Press - Punch Rivet

D 4 + D 5 - 5 mm Diameter Press - Punch Rivet

D 5 + D 12 - 8 mm Diameter Hole Punch - Welded Joint Drill

D 6 + D 7 - 4.8 mm Diameter Hole Stamp - Pop Rivet

D8+D8-Panel Reshaping

D 8 + D 9 - Pressure of 4 mm - Solid Rivet

D 10 + D 11 - Hole Punch and Stamp 4 mm Diameter - Solid Rivet

D 13 + D 14 - 5.3 x 7.5 mm Diameter Press - Punch Rivet

D 17 + D 17 - Panel Reshaping

D 15 + D 16 - 6.0 mm Diameter Hole Stamp - Solid Rivet

D 17 + D 17 - Pressure of 6.0 mm - Solid Rivet

S 1 + D 2 - 3.2 mm Diameter Press - Punch Rivet

D6 D1 D2 D3 D4 D5 D9 D10 D7 D8 D8 D13 D15 D16 D12 D17 S1 S2 S3 S4 S5 A00-10973 S8 S7

S 2 + S 3 - 3.2 mm Diameter Positioner - Punch Rivet

S 4 + D 5 - 5.3 x 5.5 mm Diameter Press - Punch Rivet

S 5 + D 5 - 5.3 x 6.5 mm Diameter Press - Punch Rivet

S 6 + S 7 - 5.3 x 5.5 mm Diameter Positioner - Punch Rivet

S 6 + S 8 - 5.3 x 6.5 mm Diameter Positioner - Punch Rivet

7.4 Rivets and Tools Overview

Refer to ⇒ Rep. Gr. 00; Safety Precautions



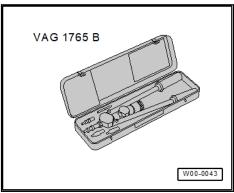
Protectedby



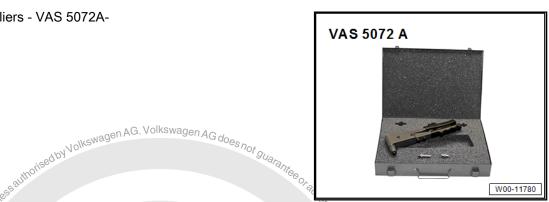
Pop Rivet Pliers - VAG 1753B-



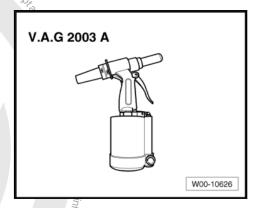
Pop Rivet Pliers - V.A.G 1765C-



Pop Rivet Nut Pliers - VAS 5072A-



Pneumatic Pop Riveter - V.A.G 2003A-Pneumatic Rivet Gun - VAS 6759-Protected barrows, in part or in whole, is, n. a.





New Beetle 1999 > , Golf 1984 > , Golf Ralley 1984 > , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

Rechargeable Riveter - VAS 5279A-

Rechargeable Riveter - VAS 843 001-

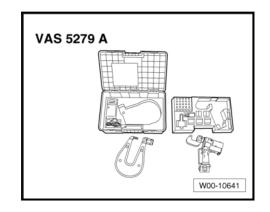
Pneumatic-Hydraulic Riveter Set - VAS 6790-

Compact Riveting Device - VAS 6792-

FD Bolt Socket - VAS852007A-

Miracle Alurepair Plus-System - VAS 852 001-

Rivet	Part number size	V.A .G 176 5	V A S 52 79	V A S 50 72	VA G 17 53 B	VA G 20 03 A	V A S 67 90	VAS6792	VA 84 3 00 1	VAS6759		VAS8520
											0 7	0
Punch Rivet	4D0 803 217 N 3.35 x 5 mm		X				X		X			
Punch Rivet	4D0 803 217 Q 3.35 x 4 mm		х				х		х		V	olks
Punch Rivet	4D0 803 217 L 5.3 x 5 mm		х				X	unles	X autho	1500	01	
Punch Rivet	4D0 803 217 M 5.3 x 6.5 mm		х			Whole, is not a	S.V		Х		00/	
Punch Rivet	N 909 261 02 5.3 x 6 mm		х		red di s		x		x			
Punch Rivet	N 911 365 01 5.3 x 7.5 mm		х		000	arcial purpos	x		х			
Punch Rivet	N 911 348 01 5 x 4.2 mm		х			COMME	Jen Jen		x			
Alumi- num solid rivet	N 103 239 01 4 x 8 mm		х				. ~	10,	X (%)	6,10		
Alumi- num solid rivet	N 103 240 01 4 x 12 mm		х				х		х		100 A	9,00
Alumi- num solid rivet	N 107 440 01 6 x 10 mm		х				х		х			







	Rivet	Part number size	V.A .G 176 5	Ă	V A S 50 72	VA G 17 53 B	VA G 20 03 A	VAS6790	VAS6792	VA 84 3 00 1	>4%6759	VAS852007	VAS852001	
	Alumi- num solid rivet	N 107 441 01 6 x 12 mm		х										
	Alumi- num pop rivet with a coun- ter- sunk head	4E0 809 864 A	loy Voll	SWa	gen A	<u>G</u> .Vo	lkswa	X gen,	X AG _Q	X Oes no	X Dt gu	aranı	,@0)	acceptanyliability with respect to the correctness of information in this occurrence of the correctness of the correctness of information in this occurrence of the correctness of
cial purposes, III part or in whole	Alumi- num pop rivet with a semi- round head	8Z0 809 864						X	X	X	X			bility with respect to the co
rposes, II	Flow Drill Bolts	WHT.00 3.873 M5 x 25										X		rectness
orcial pu	Flow Drill Bolts	WHT.00 6.547 M5 x 20										X		of informa
	Flow Drill Bolts	WHT.00 7.052 M5 x 18										Х		tion in this a
	Threa ded rivet	N 907 163 01 14 mm				х	х	×	Х	х	X		, 40'	Juantico
	Threa ded rivet	N 907 162 01 10 mm	OO NOI	ecte)	014	х	x	· SA	X	X	X	131161),	
	Threa ded rivet	N 907 161 01 22 mm			7	х	х	х	х	х	Х			
	Threa ded rivet	N 907 160 01 6 mm				Х	х	х	Х	х	Х			
	Pop Rivet	WHT 005 413 A 6.5 mm rivet material strength : 5-9 mm				X	X	X	x	х	x			



D: (- ·	\ / A		.,	1.74	1/4	.,	.,	altho,		.,		1
Rivet	Part number size	V.A .G 176 5	V A S 52 79	V A S 50 72	VA G 17 53 B	VA G 20 A A O O O O O O O O O O O O O O O O O	V A S 67 90	VAS6792	84 3 00 1	VAS6759	VAS852007	VAS852001	
Pop Rivet	WHT 005.697 6.5 mm rivet material strength : 3 - 4.8 mm				X X	X	x	x	x	x			
Pop Rivet	WHT 911.527 .01 6.5 mm rivet material strength : 4.5 - 7.0 mm				X	DIAMUNOO JO	X	X	X X	X			
Pop Rivet	N 909 236 01 4.8 mm rivet material strength : 2.4 - 4.8 mm				x	x	х	x	х	x	00/10	7/PƏ _J	Dέ
Pop Rivet	N.906.9 24.02 4.8 mm rivet material strength : 1.5 - 3.5 mm				х	х	х	x	х	x			
Pop Rivet	4S0 843 658				Х	Х	х	х	х	х			
Pop rivet screw	WHT 005 180	V.A .G 176 5 C/2											
Pop rivet screw	N.910.0 11.01	V.A .G 176 5 C/4											
Pop Rivet Nut	N.910.3 77.01 M10	V.A .G 176 5											
Pop Rivet Nut	N.908.5 68.02 M8	V.A .G 176 5											



Rivet	Part number size	V.A .G 176 5	V A S 52 79	V A S 50 72	VA G 17 53 B	VA G 20 03 A	V A S 67 90	VAS6792	VA 84 3 00 1	VAS6759	VAS852007	VAS852001
Weld Studs	VAS 852 001/1 5 mm							х				х
Weld Studs	VAS 852 001/2 4 mm							х				х

Refer to ⇒ Rep. Gr. 00; Safety Precautions

7.5 Flow-Drill Bolts

⇒ "7.5.1 Flow Drill Bolt Connection, Producing, Upper Section Pre-Punched", page 45

⇒ "7.5.2 Flow Drill Bolt Connection, Producing, Upper Section Not Pre-Punched", page 46

⇒ "7.5.3 Flow Drill Bolt Connection, Creating, When Replacing Upper and Lower Section", page 46

When using flow-drill bolts, the lower component is heated by the frictional heat generated by the turning bolt. Then the selftapping screw is screwed into the soft aluminum.

Flow-Drill Bolt Connections, Servicing



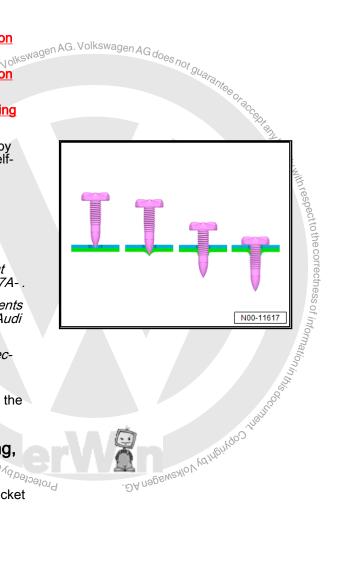
Note

- ♦ Flow-drill bolts have been introduced on the Audi R8 that can be replaced using the FD Bolt Socket VAS 852 007A-.
- The repair concept for the pure aluminum body components is the same as the repair procedures used on previous Audi aluminum vehicles.
- Using the tool allows the best use of the threaded connection during repairs.

The production of a flow drill bolt connection is presented in the following based on three examples.

7.5.1 Flow Drill Bolt Connection, Producing, Upper Section Pre-Punched

- Loosen the flow drill bolt threaded connection using a socket for flow drill bolts.
- Remove the upper section.
- Preparing the connection points for applying adhesive.
- Clean the adhesion area with cleaning solution.
- Apply two-part epoxy adhesive to the entire area.
- Position the new part and connect with a suitable pop rivet.





Diame- ter	Part Number	Clamping area
1. Di- ameter 6.5 mm	WHT.005.697	2.8 mm - 4.8 mm
2. Di- ameter 6.5 mm	N 911.527.01	4.7 mm - 7.00 mm
3. di- ameter 6.5 mm	N 904.692.02	6.8 mm - 8.8 mm

7.5.2 Flow Drill Bolt Connection, Producing, Upper Section Not Pre-Punched

- Loosen the flow drill bolt threaded connection using a socket for flow drill bolts.
- Remove the upper section.
- Insert the hole finder into the existing flow drill bolt threads.
- Position the new part.
- Label the holes in the new part by hitting it lightly with a plastic hammer.
- Remove the upper section.
- Drill 6.5 mm diameter holes in the new part.
- Preparing the connection points for applying adhesive.
- Clean the adhesion area with cleaning solution.
 - Apply two-part epoxy adhesive to the entire area.
 - Position the new part and tighten using the flow drill bolt socket and gradually tighten new bolts to 5 Nm.
- If the tightening specification is not reached, replace the flow drill bolts with a pop rivet.

Diame- ter	Part Number	Clamping area
1. Di- ameter 6.5 mm	WHT.005.697	2.8 mm - 4.8 mm
2. Di- ameter 6.5 mm	N 911.527.01	4.7 mm - 7.00 mm
3. di- ameter 6.5 mm	N 904.692.02	6.8 mm - 8.8 mm

7.5.3 Flow Drill Bolt Connection, Creating, When Replacing Upper and Lower Section

- Loosen the flow drill bolt threaded connection using a socket for flow drill bolts.
- Remove both sections.
- Using both parts at the same distance as with the original connection, make 4 mm holes.
- Remove the new parts.



- Expand the 4 mm holes in the upper section to 7 mm.
- Preparing the connection points for applying adhesive.
- Clean the adhesion area with cleaning solution.
- Apply two-part epoxy adhesive to the entire area.
- Position the new part and connect with a suitable pop rivet.

Diame- ter	Part Number	Clamping area
1. Di- ameter 6.5 mm	WHT.005.697	2.8 mm - 4.8 mm
2. Di- ameter 6.5 mm	N 911.527.01	4.7 mm - 7.00 mm
3. di- ameter 6.5 mm	N 904.692.02	6.8 mm - 8.8 mm

7.6 Clinching

Clinching is a press-joining process to connect sheet metal without using additional materials. One can expect to apply it to joining procedures as well as to reforming procedures, because the connection is attained by reforming the material.

Repair Information

- First make separating cuts, if necessary.
- Remove the old flange by peeling.
- Align the remaining flange.



Note

Adjust the rivet tool to material thickness for all procedures.

- Remove the damaged part, separate with a chisel if necessary.
- Fit new parts, and install solid or pop rivets based on the repair manual "Body Repair".

Devices

Only the devices approved in the Workshop Equipment Catalog may be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

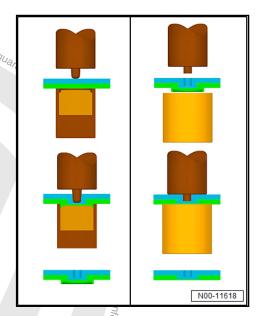
Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices approved in the Workshop Equipment Catalog

May be used.

Only the devices appro





8 Separation Technologies in Body Repair; Application

- ⇒ "8.1 Drilling", page 48
- ⇒ "8.2 Sawing", page 48
- ⇒ "8.3 Sanding", page 48
- ⇒ "8.4 Milling", page 49
- ⇒ "8.5 Bonded Joints, Detaching", page 49
- ⇒ "8.6 Removing Rivets Accessible on One Side", page 50

8.1 Drilling

Drilling is used to loosen resistance weld spots and rivets. Make sure no underlying components are damaged while drilling. When loosening two or more welded connections, the panel remaining on the vehicle may not be impaired more than necessary.



Note

- After drilling, carefully remove any drill shavings from the cavities (vacuum).
- Magnetic components, such as speakers, must be removed from the repair area.

8.2 Sawing

The technician will decide between the two established device types for sawing:

- Short stroke pneumatic saw
- Oscillating saw

Advantages of the short stroke pneumatic saw:

- Faster separation.
- Possible to saw curves.
- Can also be inserted at sharply angled profiles.

Advantages of the oscillating saw:

- Clean, straight cuts.
- Proved

 Proved Low penetration depth, therefore it is particularly suitable for double-layer panels.



Note

- After sawing, carefully remove any saw shavings from the cavities (vacuum).
- Magnetic components, such as speakers, must be removed from the repair area.

8.3 Sanding

Sanding can be a very favorable alternative to drilling, especially when loosening high-strength welded connections. Weld points, laser weld connections, or brazed seams can be loosened very efficiently by sanding. Also make sure here that the



underlying materials are not impaired or damaged any more than necessary.

Disadvantages of sanding:



- advantages of sanding:

 Due to the flying sparks, extensive protective necessary on the vehicle and in the surrounding area.

 Higher temperature build-up than when drilling, thus more damage to residual material and corrosion protection. Page AG does not gualante out and gualan

8.4 Milling

In body repairs, the technician decides between a ball end nose mill -A- and a BTR mill -B-.

A ball end nose mill is used if the spacial conditions do not allow the BTR mill to be used for loosening weld points.

When working with the BTR mill, it must be made sure that cuts do not tilt into the high-strength steel. They can break easily due to the hardness of the cuts. Therefore, it should always be worked with a suitable tool (not a hand drill).



Note

- After milling, carefully remove any shavings from the cavities (vacuum).
- Magnetic components, such as speakers, must be removed Protected by, from the repair area.

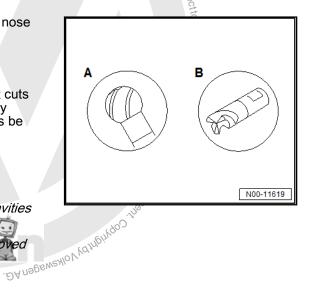
8.5 Bonded Joints, Detaching

Body bonded joints can be detached by applying heat. The adhesives used in the vehicle construction and the repair are destroyed at temperatures 180 – 200°C (392 °F).



Note

- Wear protective gloves and eyewear.
- Avoid direct contact of the adhesives with the skin.
- Avoid inhaling solvent vapors.
- Only process adhesives in well-ventilated areas.
- Always note the hazard information from the manufacturer.
- Also note the accident prevention regulations applicable in the respective country.
- Note the corresponding safety data sheets for the adhesive.

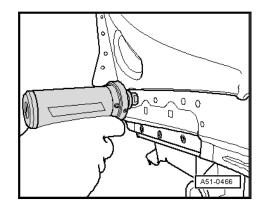




8.6 Removing Rivets Accessible on One

Work Sequence

- Remove the paint and oxide coating from the rivet head and the connection point for the ground clamps.
- Bring the ground clamps as close as possible to the rivets.



- Weld the weld studs onto the rivet.
- Remove the rivet using the weld studs and the specified tools.



Note

Refer to the vehicle-specific repair manual for tool and material information.



with respect to the correctness of information in this occurrence.



9 Surface Repairs

- ⇒ "9.1 Dent Removal Techniques, Steel Panel", page 51
- ⇒ "9.2 Dent Removal Procedures, Aluminum Panel", page 52
- ⇒ "9.3 Metal and Aluminum Body Filler, Handling", page 53
- ⇒ "9.4 Unleaded Tin, Handling", page 53
- ⇒ "9.5 Accurately Contoured Surface Definition. Transfer to ...thorised by Volksw Paint Shop", page 54



Note

sfer to

Oes not guarantee or accept and liability Generally, the inner corrosion protection must be paid attention to during all bulge corrections.

- Dent Removal Techniques, Steel Pan-9.1
- ⇒ "9.11 Classic Dent Removal Procedure, with Paint Damage", page 51
- "9.1.2 Pressing Bulge Correction Procedure, without Paint Damage", page 51
- ⇒ "9.1.3 Exterior Dent Corrections / Pulling Dent Removal Procedure", page 52
- 9.1.15 "Classic" Dent Removal Procedure, with Paint Damage

The classic dent removal method using a hammer and counterhold is rarely still used on modern vehicle bodies.

The disadvantage of this technique is that usability is limited (depending on construction) as well as the overextension of materials required by this method. The resulting excess of material must often be thermally reduced, which in turn results in considerable disadvantages for the material strength and corrosion protection.

9.1.2 "Pressing" Bulge Correction Procedure, without Paint Damage

This dent removal method that does not cause paint damage is mostly used for minor parking and hail damage. Here the dent is softly pressed outward from the inside. The pressing is done circularly around the center of the dent in multiple stages, so that the paint can also be reshaped without a formation of

A - Pressing Set Example

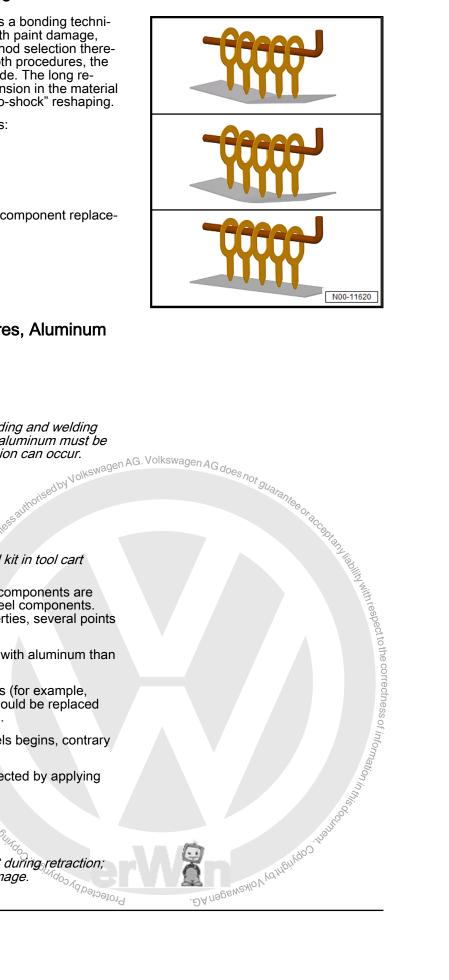
New Beetle 1999 ➤ , Golf 1984 ➤ , Golf Ralley 1984 ➤ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

9.1.3 "Exterior Dent Corrections / Pulling" **Dent Removal Procedure**

The exterior dent removal method is used as a bonding technique without damage as well as a method with paint damage, due to pulling aids being attached. This method selection therefore depends on the type of damage. For both procedures, the dent is pulled out of the panel from the outside. The long reshaping process significantly reduces the tension in the material structure. It is also referred to as "soft" or "no-shock" reshaping.

Advantages of these bulge removal methods:

- Overstretching of material is reduced
- Minimal corrosion protection damage.
- Minimal disassembling of the vehicle.
- Maintains the original joint (compared to component replace-



9.2 Dent Removal Procedures, Aluminum **Panel**



Note

Aluminum parts must be covered when sanding and welding steel parts. Any steel shavings that contact aluminum must be immediately removed or else contact corrosion can occur.



Note

- Use tools for either steel or aluminum.
- Recommendation: special aluminum tool kit in tool cart

The dent removal techniques for aluminum components are not fundamentally different than those for steel components. However, due to the different material properties, several points must be noted:

- The risk of material expansion is greater with aluminum than with steel.
- Sharp-edged and hard dent removal tools (for example, steel hammer) should be avoided and should be replaced with plastic, wood or aluminum hammers.
- Flattening procedures on aluminum panels begins, contrary to steel panels, in the center of the dent.
- If the material stretches, this can be corrected by applying heat and retracting.



Note

Do not exceed the maximum heat of 150° C during retraction, otherwise, the component may become damage.







Note

Replace the part if a tear forms when removing dents.

Controlling Temperature When Heating

No tempering colors can be recognized when heating aluminum. Therefore, the temperature must be determined using thermo-strips.

Thermo-strips change color at specific temperatures.

- A Warming area
- B Free zone
- C Thermo-strips

9.3 Metal and Aluminum Body Filler, Handling

Using metal and aluminum body filler has many advantages:

- Very good adhesive properties on bare surfaces
- Higher coat strengths are possible than with polyester body
- When handles correctly, there is a low tendency of "shrinking" or "sagging".
- Due to the low application of heat, they can also be used in areas with adhesive.
- No visible marks in the overlapping areas.



Note

Only approved body filler materials may be used.

The surface temperature must be checked when drying with the infrared heater.



Note

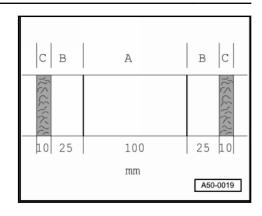
- Note the handling information on the containers.
- Adhesive residue or similar material must be completely removed from the joints before applying the body filler.
- ♦ Self-regulating infrared heaters tend to have measurement errors on small surfaces, which can lead to component dam-

Unleaded Tine Handling 9.4



Note

- Handling tin, even unleaded tin, is no longer permitted.
- To create a surface with correct contours, use the materials listed. Refer to ⇒ "9.3 Metal and Aluminum Body Filler, Han- <u>dling", page 53</u> .







9.5 "Accurately Contoured Surface" Definition, Transfer to Paint Shop

The contoured surface is a surface with the dimensional accuracy of the edges and seams to the surface.

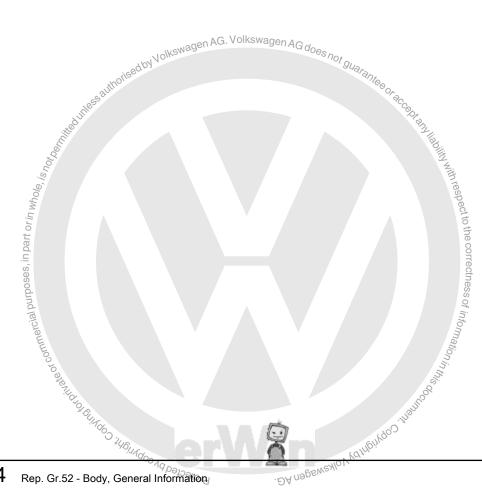
It is specified when:

- Any surfaces or parts that have been worked on, such as removing dents, welding or spackling, must be dry sanded with minimum P 80 grit sandpaper.
- The vehicle paint shop technician must then re-create the respective surface in a maximum of two steps.



Note

Only approved body filler materials may be used. Neither unleaded nor leaded alluvial tin is approved for any procedure.







11 Corrosion Protection

⇒ "11.1 Corrosion Protection on Attachments and Welded Parts", page 56

⇒ "11.2 Sealing Cavities", page 56

The standard corrosion protection must be reapplied after servicing with the materials specified by the manufacturer.

The corrosion protection used in production is described in the general and vehicle-specific > Paint Manual.

Corrosion Protection on Attachments 11.1 and Welded Parts

⇒ "11.1.1 Contact Corrosion", page 56

- Prime bare panel surfaces immediately after the repair.
- Holes must be deburred.
- Always apply welding primer/structure adhesive (according to the repair manual) to both sides of the welding flange.
- Prime the weld area on inside and outside before sealing.
- Apply sealant only to primed panels.
- Completely seal panel overlap, panel edges, butt joints, weld
- seams, etc. with sealant.

 Reproduce the paint structure as described in the paint man paint man
- Restoring the underbody protection with long-term underbody protective material.
- Apply protective material to all cavities in repair area after finish painting.
- Protective material must be completely applied on separation cuts (for example, in side panel).
- Open water drains after cavity sealant material dries.

11.1.1 Contact Corrosion

Contact corrosion can occur if incorrect connecting elements (bolts, nuts, washers, etc.) are used.

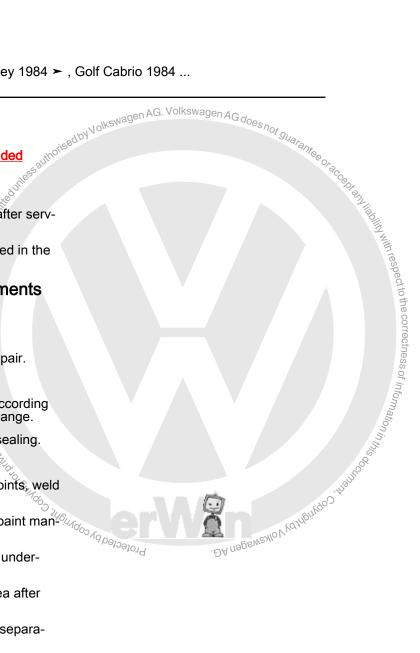
For this reason, only fasteners with a special surface coating may be installed.

Furthermore, only rubber/plastic parts and adhesive made of electrically non-conductive materials are used.

If there are doubts about the suitability of parts, use new parts.

11.2 **Sealing Cavities**

The corrosion protection used in production is described in the general and vehicle-specific ⇒ Paint Manual.











Cleaning

- beginning the process, it is required to become familth the safety information sheet covering safety precaus and safety recommendations.

 In the safety information sheet covering safety precaus and safety recommendations.

 In the safety information sheet covering safety precauprecautions for chemical products must be followed.

 In the type of cavity being treated, the drying proc"a more than several days. Sufficient ventilation

 "I not the type of cavity being treated, the drying proc"a more than several days. Sufficient ventilation

 "I has brake and exhaust systems

 "has brake and exhaust systems

 "ed away.

 "y drips on

 "an"ne"O'Y De Generico Marketing and the state of the safety of the sa

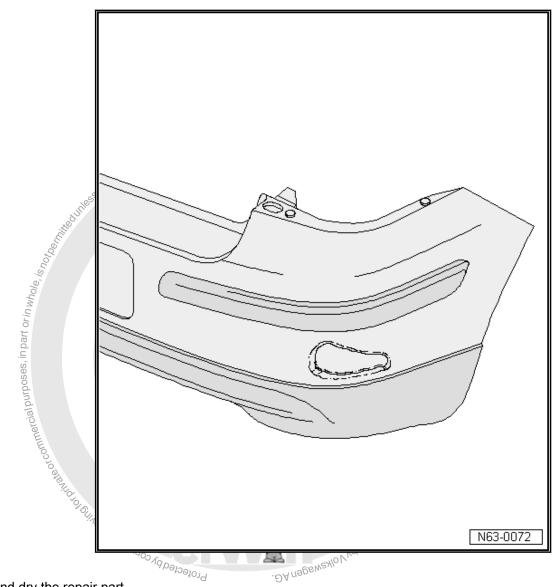




isedby Volkswagen AG. Volkswagen AG does not guaran New Beetle 1999 ➤ "Golf 1984 ➤ , Golf Ralley 1984 ➤ , Golf Cabrio 1984 ...



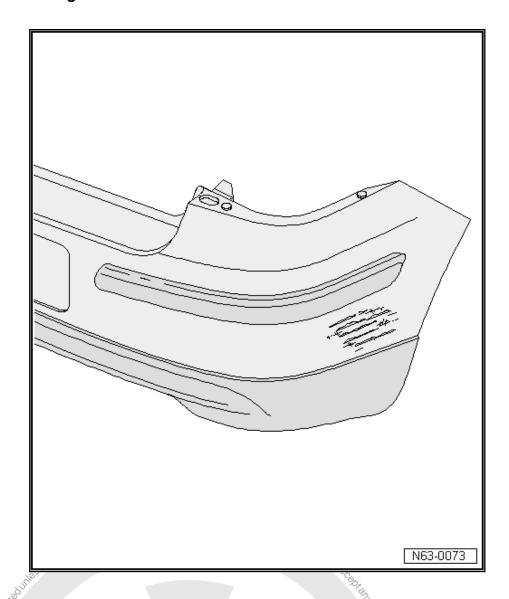




- First clean and dry the repair part.
- Warm the dented area with a hot air gun until it can be pressed out with a suitable tool.
- Now sand the dented area with 120 grit sandpaper.
- Then clean the repair area with cleaner. Flash-off time is five minutes.
- Now spray lightly with bonding agent and allow 10 minutes flash-off time.
- Now any uneven areas can be filled with adhesive and smoothed out with a spatula.
- Curing can be accelerated with an infrared heater. Set it for 15 minutes at 60°-70 °C.
- Now sand the repair location down with 120 grit sandpaper.
- Now remove the sanding dust.
- Now spray lightly with bonding agent and allow 10 minutes flash-off time.
- Create the paint structure according to the paint repair manual.



12.2 Scratches, Servicing



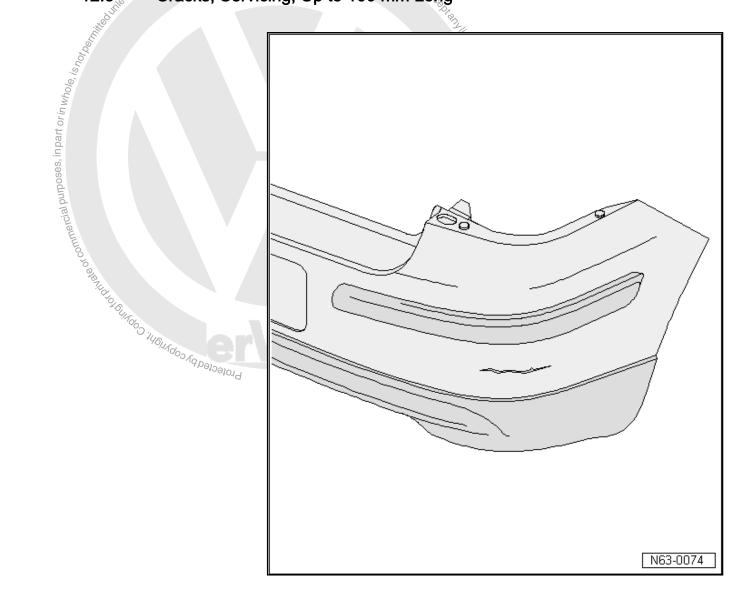
Volkswagen AG.

- First clean and dry the repair part.
- Remove stuck material with 80 grit sandpaper.
- Then clean the repair area with cleaner. Flash-off time is five minutes.
- Now spray lightly with bonding agent and allow 10 minutes flash-off time.
- Now any uneven areas can be filled with adhesive and smoothed out with a spatula.
- Curing can be accelerated with an infrared heater. Set it for 15 minutes at 60°-70 °C.
- Now sand the repair location down with 120 grit sandpaper.
- Now remove the sanding dust.
- Now spray lightly with bonding agent and allow 10 minutes flash-off time.
- Create the paint structure according to the paint repair manual.

Protected by c



12.3 Cracks, Servicing, Up to 100 mm Long



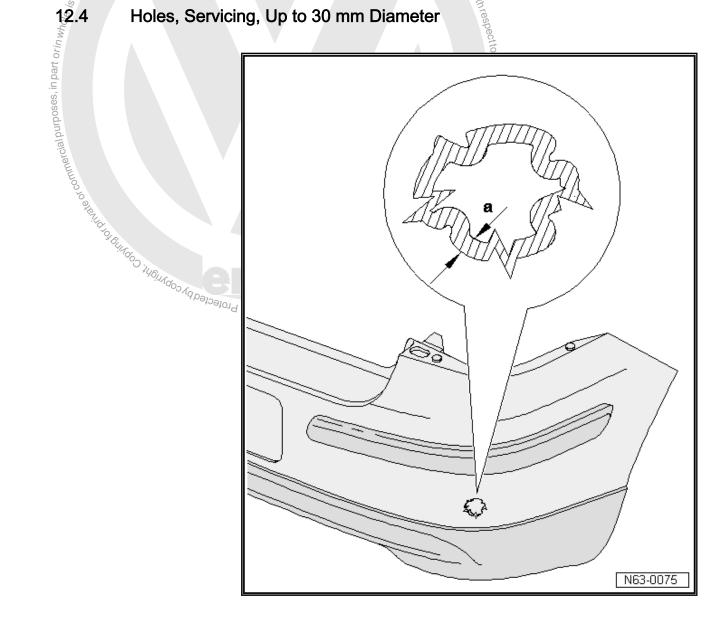
- First clean and dry the repair part.
- Uneven areas can be removed through expanding by drilling the crack (5 mm) and sanding it in a V-formation.
- Then clean the repair area with cleaner. Flash-off time is five minutes.
- Now spray lightly with bonding agent and allow 10 minutes flash-off time.
- First, install a reinforcement mat on the back of the repair part using adhesive so that it overlaps the damaged parts by at least 20 mm.
- Curing can be accelerated with an infrared heater. Set it for 15 minutes at 60°-70 °C.
- Then, the front side of the sanded area can be filled with adhesive and smoothed with a spatula.
- Curing should be accelerated on the front side with the infrared heater as explained earlier.
- Now sand the repair location down with 120 grit sandpaper.



New Beetle 1999, Solf 1984 → Golf Ralley 1984 ➤ , Golf Cabrio 1984 ... Body - General Information - Edition 10.2024

- Now remove the sanding dust.
- Now spray lightly with bonding agent and allow 10 minutes flash-off time.
- Create the paint structure according to the paint repair man-

12.4 Holes, Servicing, Up to 30 mm Diameter



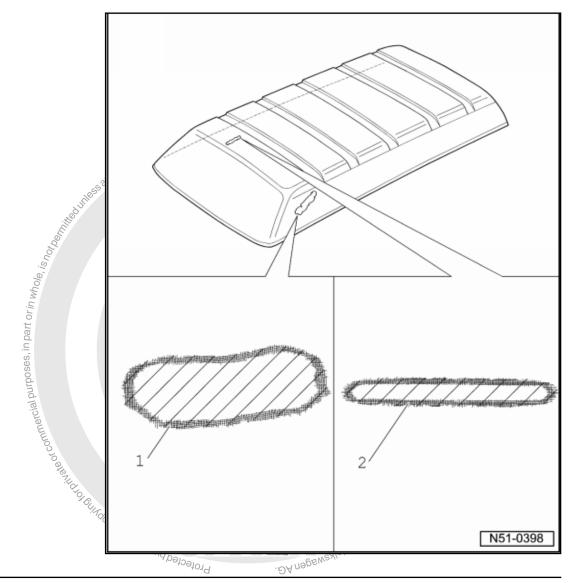
- First clean and dry the repair part.
- Using 120 grit sandpaper, sand the repair location in a funnel shape 10-20 mm, dimension a.
- Now spray lightly with bonding agent and allow 10 minutes flash-off time.
- Then rough up the area with 120 grit sandpaper.
- Then clean the repair area with cleaner. Flash-off time is five minutes.
- Now spray lightly with bonding agent and allow 10 minutes flash-off time.



- First, install a reinforcement mat on the back of the repair part using adhesive so that it overlaps the damaged parts by at least 20 mm.
- Curing can be accelerated with an infrared heater. Set it for 15 minutes at 60°-70 °C.
- Then, the front side of the sanded area can be filled with adhesive and smoothed with a spatula.
- Curing should be accelerated on the front side with the infrared heater as explained earlier.
- Now sand the repair location down with 120 grit sandpaper.
- Now remove the sanding dust.
- Now spray lightly with bonding agent and allow 10 minutes flash-off time.
- Create the paint structure according to the paint repair manual.

12.5 Plastic Repair (GFK)

- ⇒ "12.5.1 Crack Repair Procedure, Servicing", page 64
- ⇒ "12.5.2 Surface Damage Repair Procedure, Servicing", page 65





Note

Follow the general accident prevention tips. Do not repair safety-related components whose function can no longer be guaranteed after servicing, for example, those that absorb impact.

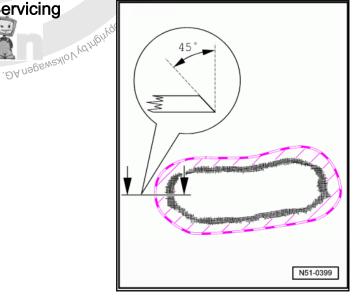
- 1- Crack
- ◆ Fibe glass mat, polyester resin and hardener
- 2- Surface damage
- ◆ Fiber glass reinforced polyester resin, hardener



Note

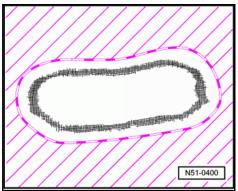
Follow the usage instructions from the manufacturer when working with the materials.

12.5.1 "Crack" Repair Procedure, Servicing



t and liability with respect to the correctness of information in this co.

 Sand off the edge of the crack all around at approximately a 45° angle.





- Sand the surface down approximately 100 mm all around the crack -shaded area- with 150 grit sandpaper and clean with silicone remover.
- Cut the three fiber glass mats: -1- approximately 25 mm overlapping the crack, -2- approximately 50 mm overlapping, -3- approximately 75 mm overlapping.



Note

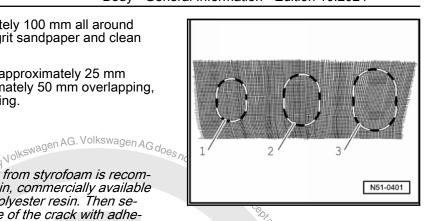
With larger cracks, creating a support from styrofoam is recommended. Wrap the styrofoam with plain, commercially available PE plastic film to avoid contact with polyester resin. Then secure the finished support on the inside of the crack with adhesive tape.

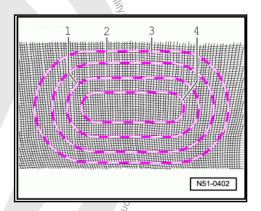
Install the fiber glass mats

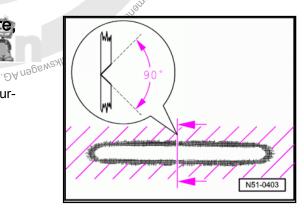
- Mix the polyester resin (follow the manufacturer's instructions).
- Apply the polyester resin lightly to the crack.
- Saturate the smallest fiber glass mat -1- with polyester resin and apply to the crack -4-.
- Remove air bubbles in the polyester resin with a pointed tool immediately after applying.
- After hardening, sand the material applied with 120 grit sandpaper.
- Clean the repair location with silicone remover.
- Repeat the procedure with the second -2- and third -3- fiber glass mats.

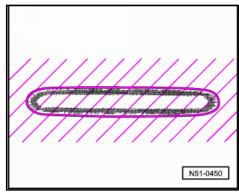
12.5.2 "Surface Damage" Repair Procedure, Servicing

- Grind down the surface damage in a V-shape.
- Sand the surface approximately 50 mm all around the surface damage -shaded area- with 150 grit sandpaper.
- Clean the repair location with silicone remover.
- Mix fiber glass reinforced polyester resin (follow the manufacturer's instructions) and apply it to the repair location -shaded area-.
- After curing, sand down the repair location and clean with silicone remover.











13 Glass Repair

⇒ "13.1 Windshield Repair", page 66

13.1 Windshield Repair

⇒ "13.1.1 Requirements", page 66

⇒ "13.1.2 Repair Description", page 67

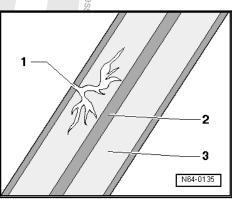
Aside from replacing bonded windshields, there is the less expensive option of repairing a windshield that has been damaged by a stone, under certain conditions.

Tinted windshields, windshields with colored liners or insulated glass, and windshields with a heat function can also be repaired, because the tint and near are ennued by the interlayer.

Repairing the windshield is preferred to replacing it under the sugar and conditions

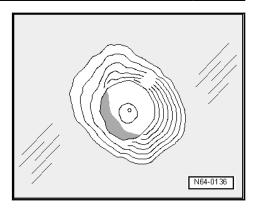
Requirements 13.1.1

- N64-0134
- The damage location must not lie within the driver's direct field of vision -1-. This field corresponds to a strip approximately 29 cm wide (DIN A4 format across) central to the driver's line of sight in direction of travel, bordered above and below by the windshield washer field.
- Cracks radiating out from the damage location -2- must not be longer than 50 mm and/or continue outward into the peripheral area.
- The diameter of the point of impact -1- must not be larger than 5 mm.
- The intermediate foil -2- or interior glass -3- must not be damaged.
- There must not be any dirt or moisture penetrating into the lower area of the crack.
- Therefore, the date of damage should not date back very





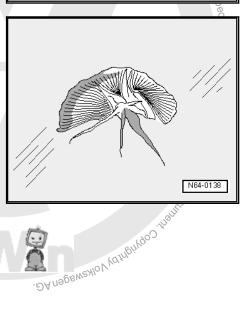
The following damage may be repaired as long as it is not in the field of vision or in the peripheral areas of the windshield:



Bullseye

tion
Tictions fr N64-0137

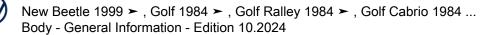
Combination break Star and crack



13.1.2 **Repair Description**

Use the repair procedure from the instructions for the repair kit approved in workshop equipment.

- Repairs should not take place in direct sunlight.
- The repair location must be approximately room tempera-
- The work area must be protected against moisture.





Note

- ♦ After the repair, the vehicle is ready to operate again without any waiting time.
- Traces of fractures cannot be removed completely with many types of breaks but they do not affect the results of the repair.

♦ After repair, the window is as strong as normal and further cracks are prevented by the molded and hardened plastic resin. The hardened resin is colorless and has the same refractive index as glass.





14 **Thread Repairs**

⇒ "14.1 Thread Repairs on Safety-Related Components", page

If damaged threads are repaired, inserts with zinc-nickel coating must be used.

Steel shavings from drilling must be removed completely.

Only replace threaded pins with original parts.

, epa Juliorijsed by Volkswage Damaged threads can be repaired with thread inserts with zincnickel coating.



Note

Contact corrosion is prevented only by using this coating.

Some threads are already supplied with thread inserts at the factory.

14.1 Thread Repairs on Safety-Related Components

this coating.

ad inserts at the

ty-Related

characteristics, repunts are permitted

characteristics, repunts are permitted

characteristics, repunts are permitted Depending on the vehicle-specific structure characteristics, repairs to threads such as axle or seat belt mounts are permitted are not feasible.



Note

Always refer to the vehicle-specific repair manuals for this.

Arto Bridgo ingingoo ya basasaya



Cautions & Warnings

Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Volkswagen retailer or other qualified shop. We especially urge you to consult an authorized Volkswagen retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Volkswagen.
- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Volkswagen is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Volkswagen retailer parts department for the latest information.
- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the Volkswagen Factory Approved Scan Tool (ST).
- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.
- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.
- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it
- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.
- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.
- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid.
 Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.
- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.
- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.

Page 1 of 3

All rights reserved. Information contained in this document is based on the latest information available at the time of printing and is subject to the copyright and other intellectual property rights of Volkswagen of America, Inc., its affiliated companies and its licensors. All rights are reserved to make changes at any time without notice. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, nor may these materials be modified or reposted to other sites, without the prior expressed written permission of the publisher.

Cautions & Warnings

- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.
- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.
- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the
 instructions thoroughly; do not attempt shortcuts. Use tools that are appropriate to the work and use only
 replacement parts meeting Volkswagen specifications. Makeshift tools, parts and procedures will not make good
 repairs.
- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.
- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.
- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.
- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.
- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.
- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.
- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will
 increase system pressure and may cause the system to burst.
- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).
- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that
 automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device.
 Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal
 injury. To guard against personal injury or airbag system failure, only trained Volkswagen Service technicians
 should test, disassemble or service the airbag system.

Cautions & Warnings

- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.
- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Volkswagen Service technicians using the Volkswagen Factory Approved Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.
- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.
- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

I have read and I understand these Cautions and Warnings.



All rights reserved. Information contained in this document is based on the latest information available at the time of printing and is subject to the copyright and other intellectual property rights of Volkswagen of America, Inc., its affiliated companies and its licensors. All rights are reserved to make changes at any time without notice. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, nor may these materials be modified or reposted to other sites, without the prior expressed written permission of the publisher.